Volume 94
Number 3
2007

Annals
of the
Missouri
Botanical
Garden

MISSOURI BOTANICAL
OCT 15 2007
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REVISION OF *WIELANDIA*, INCLUDING *BLOTIA* AND *PETALODISCUS* (PHYLLANTHACEAE; EUPHORBIACEAE S.L.)[1]

Petra Hoffmann[2] *and Gordon McPherson*[3]

ABSTRACT

The Western Indian Ocean genus *Wielandia* Baill. (Phyllanthaceae, Phyllanthoideae, Wielandieae) is revised, recognizing 13 species, including the new species *W. unifex* Petra Hoffm. & McPherson. As a result of recent molecular phylogenetic work and the discovery of the enigmatic *W. unifex*, all species of *Blotia* Leandri and *Petalodiscus* Baill. are subsumed under *Wielandia*. The following new combinations result: *W. bemarensis* (Leandri) Petra Hoffm. & McPherson, *W. fadenii* (Radcl.-Sm.) Petra Hoffm. & McPherson, *W. laureola* (Baill.) Petra Hoffm. & McPherson, *W. leandriana* (Petra Hoffm. & McPherson) Petra Hoffm. & McPherson, *W. mimosoides* (Baill.) Petra Hoffm. & McPherson, *W. oblongifolia* (Baill.) Petra Hoffm. & McPherson, *W. platyrachis* (Baill.) Petra Hoffm. & McPherson, and *W. tanalorum* (Leandri) Petra Hoffm. & McPherson. In addition, *W. bojeriana* (Baill.) Petra Hoffm. & McPherson, *W. danguyana* (Leandri) Petra Hoffm. & McPherson, and *W. ranavalonae* (Leandri) Petra Hoffm. & McPherson are transferred from *Savia* Willd., a genus now restricted to the Neotropics. Three species, *Petalodiscus pulchellus* (Baill.) Pax, *Savia andringitrana* Leandri, and *S. revoluta* Scott-Elliot, and four varieties, *Blotia oblongifolia* (Baill.) Leandri var. *lourelii* Leandri, *Savia andringitrana* Leandri var. *micrantha* Leandri, *S. bojeriana* Baill. var. *perrieri* Leandri, and *S. platyrachis* (Baill.) Baill. var. *microphylla* Leandri, are subsumed under other species. Characters of flower, fruit and seed, leaf venation and anatomy, as well as pollen morphology are discussed and illustrated. A key to the 13 species of *Wielandia* is presented. *Wielandia fadenii*, previously known only from Kenya, is for the first time reported from Madagascar and the Comoro Islands. Seeds of *W. danguyana*, *W. fadenii*, and *W. ranavalonae* are described and illustrated for the first time, showing a wide range of embryo morphology. Distribution maps are provided for the species not previously treated as *Blotia* or *Wielandia* s. str., and IUCN Red List categories are suggested for all taxa.

Key words: *Blotia*, Euphorbiaceae, IUCN Red List, Kenya, leaf venation, Madagascar, *Petalodiscus*, Phyllanthaceae, *Savia*, *Wielandia*.

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[1] We gratefully acknowledge the following herbaria for access to their collections: A, B, BM, G, HBG, K, M, MO, P, S, TAN, TEF, US. The first author thanks Prof. E. Köhler (BHU) for his invaluable support during this project, J. Ueckert for assistance with photographic work and friendship throughout the project, Prof. W. Greuter (B) for help with nomenclatural queries, as well as Prof. H. H. Hilger, Dr. S. Rogaschewski, Dr. W. Wenzel, Ms. Domes, Ms. Grüber, Ms. Ritter, and Ms. Weise (all Berlin) for access to and assistance with the SEM. We thank S. Rakotoarisoa (K) for help with the Malagasy localities, J. Moat (K) for help with IUCN ratings, D. Bills (MO) for preparing the maps, C. Wardrop (NSW) for drawing Figures 13 and 14, and A. Radcliffe-Smith (formerly K) for help in choosing an epithet for the new species. Fieldwork was conducted under collaborative agreements between the Parc Botanique et Zoologique de Tsimbazaza (PBZT), the University of Antananarivo, the Association Nationale pour la Gestion des Aires Protégées (ANGAP) on the one hand, and RBG, Kew, and the Missouri Botanical Garden on the other.

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ANN. MISSOURI BOT. GARD. 94: 519–553. PUBLISHED ON 4 OCTOBER 2007.

Wielandia Baill. as circumscribed here is a genus of 13 species in tribe Wielandieae of the medium-sized pantropical family Phyllanthaceae (ca. 2000 species). This family is one of the segregates from Euphorbiaceae s.l. (APG, 2003) and corresponds with some modifications (Wurdack et al., 2004; Kathriarachchi et al., 2005) to Euphorbiaceae subfamily Phyllanthoideae (Webster, 1994b; Radcliffe-Smith, 2001). Tribe Wielandieae as circumscribed in the classification of Phyllanthaceae (Hoffmann et al., 2006) consists of six small or monospecific genera (*Astrocasia* B. L. Rob. & Millsp., *Chascotheca* Urb., *Chorisandrachne* Airy Shaw, *Dicoelia* Benth., *Heywoodia* Sim, *Wielandia* s.l.) and has a disjunct distribution throughout the tropics. *Wielandia* s.l. is the only genus in the tribe occurring in the western Indian Ocean region. Species here united in *Wielandia* have previously been treated as members of *Blotia* Leandri, *Petalodiscus* Baill., and *Savia* Willd.

The tribe had been placed at the beginning of subfamily Phyllanthoideae in classifications of Euphorbiaceae s.l. (Webster, 1994b; Radcliffe-Smith, 2001), thereby becoming the first tribe of the family listed in these treatments. This was mainly due to the relatively complete flowers with sepals, petals, and a disc in both sexes, as well as a pistillode in staminate flowers. *Wielandia elegans* Baill. is conspicuous in Euphorbiaceae s.l. for having perfectly pentamerous flowers. Webster (1994b: 36) placed *Heywoodia* from southern Africa at the beginning of his last synoptic treatment, considering it to be "perhaps nearest in morphological characters to the hypothetical ancestor of the family." Both are members of tribe Wielandieae in the recent phylogenetic classification (Hoffmann et al., 2006).

Wielandia s.l. has not received much attention from taxonomists in recent decades other than in regional treatments (e.g., Leandri, 1958; Radcliffe-Smith, 1987). The last complete revision of the group was published in *Pflanzenreich* (Pax & Hoffmann, 1922), where *Petalodiscus* was included in *Savia*, along with species from South Africa, the West Indies, and North and South America. Further contributions to the taxonomy of this group have been made by Leandri (1957), Radcliffe-Smith (1972, 1992), and Webster (1994b).

Results of molecular phylogenetic studies show that *Savia* s.l. is triphyletic (Wurdack et al., 2004; Kathriarachchi et al., 2005) with other species now classified in tribes Bridelieae and Phyllantheae (Hoffmann et al., 2006). The constituent taxa are not congruent with the sections of Pax and Hoffmann (1922). Two of their *Savia* species (*S. ovalis* (Sond.) Pax & K. Hoffm. and *S. phyllanthoides* (Nutt.) Pax & K. Hoffm.) must be referred to *Andrachne* L. s.l. (Hoffmann, 1994; 2000) in tribe Poranthereae, where they represent distinct genera (Vorontsova & Hoffmann, 2008). The remainder are clearly divided by embryo and epidermis characters as well as breeding system into a Paleotropical group represented by *Wielandia* s.l., including *Blotia* and *Petalodiscus*, and a Neotropical group containing *Gonatogyne* Klotzsch ex Müll. Arg., *Savia* s. str. (both Bridelieae; see Hoffmann & Cordeiro, in prep.), and *Savia* sect. *Heterosavia* Urb. (Phyllantheae; see Kathriarachchi et al., 2006; Hoffmann, 2008). Previously published taxonomic revisions of Wielandieae in this series include *Blotia* (Hoffmann & McPherson, 1998) and *Wielandia* s. str. (Hoffmann, 1998).

TAXONOMIC HISTORY

Wielandia and *Petalodiscus* were first described by Baillon (1858), differing in their pentamerous versus trimerous ovary. On page 571, *Savia* sect. *Petalodiscus* Baill. is described, with two nomina nuda listed under it (p. 572), including *Savia* (section *Petalodiscus*) *platyrachis* (Baill.) Baill. In the atlas (plate 22) contained in the same volume, there is a drawing with analysis of *P. platyrachis* Baill., which thus constitutes a valid "descriptio generico-specifica" according to Art. 42 of the International Code of Botanical Nomenclature (Greuter et al., 2000: 67). Both the generic name *Petalodiscus* and the sectional name *Savia* sect. *Petalodiscus* were simultaneously and validly created as alternative names (Art. 34.2 of this Code). Baillon proposed two more names, *Savia pulchella* Baill. (= *Wielandia platyrachis* (Baill.) Petra Hoffm. & McPherson) and *S. mimosoides* Baill. (= *W. mimosoides* (Baill.) Petra Hoffm. & McPherson), under *Savia* sect. *Charidia* Baill. in this work, and he furthermore included section *Eusavia* Baill. (only *S. sessiliflora* (Sw.) Willd. from the West Indies, now in tribe Bridelieae) and section *Actephila* (Blume) Baill. from Asia (now in tribe Poranthereae).

Baillon validated his nomina nuda in a later publication (1861: 33–35) and placed most of these taxa unequivocally in *Savia*, distinguishing the sections *Charidia* and *Petalodiscus* mainly by a short and thick floral disc versus a long and petaloid one, respectively. Müller (1866: 228–231) excluded *Actephila* and included monotypic *Wielandia* (*W. elegans*). Bentham (1878: 208) as well as Bentham and Hooker (1880: 270) excluded *Wielandia* from *Savia* again, a view adopted by authors for more than a century (Webster, 1994b; Radcliffe-Smith, 2001). In the first edition of *Natürliche Pflanzenfamilien*, Pax (1890: 15) separated all Madagascan species of *Savia* as *Petalodiscus* and retained only the Neotropical taxa in *Savia*. In *Pflanzenreich* (Pax & Hoffmann, 1922:

181) and in the second edition of *Natürliche Pflanzenfamilien* (1931: 67), however, Pax and Hoffmann reverted to a broad circumscription of *Savia*, even including two species belonging in unrelated *Andrachne* s.l. (Hoffmann, 1994). Like Baillon, Pax and Hoffmann based their sections of *Savia* on disc morphology, and the Madagascan taxa were distributed in sections *Maschalanthus* Pax (with annular floral disc; including Baillon's section *Charidia*) and *Petalodiscus* (with free disc glands).

The inclusion of West Indian, South American, and Madagascan elements in *Savia* made this genus an example of a highly disjunct transatlantic distribution (e.g., Pax & Hoffmann, 1931: 29; Leandri, 1937: 95; Howard, 1973: 35; Borhidi, 1985: 23, 1991: 262; Webster, 1994a: 21, fig. 1). The unfortunate emphasis on disc morphology in the sectional classification added to the taxonomic confusion. Baillon himself remarked (1868: 345) that *Savia bojeriana* Baill. stood between sections *Charidia* and *Petalodiscus* in *Savia*. Leandri (1958) questioned the suitability of the disc morphology for sectional classification but used these sections nonetheless. How unnatural these sections really are becomes clear in the present revision, where two species of *Savia* section *Maschalanthus* (*S. pulchella* and *S. revoluta* Scott-Elliot) are synonymized with two species of section *Petalodiscus* (*S. platyrachis* and *S. bojeriana*, respectively).

Leandri (1957: 241, fig. 7.14) was the first author to draw attention to the remarkable seed characters of this heterogeneous group treated as *Savia*. Only concerned with the Madagascan species, he found that some species of section *Maschalanthus* had thin, plicate embryos, whereas the remainder had thick, roughly hemispherical cotyledons. This led him to describe the first group as genus *Blotia* with initially five species, three of which had been described previously in *Savia*. Leandri also described three new *Savia* species and three new varieties from Madagascar between 1934 and 1958.

The last species to be described in this group was one of the most intriguing. *Savia fadenii* Radcl.-Sm. is the only species occurring in continental Africa and was initially only known from southeastern Kenya. Radcliffe-Smith (1972: 508) created the monotypic *Savia* sect. *Afrosavia* Radcl.-Sm. to accommodate this species, and he later (1992: 679) transferred it to *Petalodiscus*. In the course of this revision, a sizeable amount of material of this species from northern and western Madagascar was found in the Paris herbarium. Why Leandri never described this distinctive species remains unknown. Recently, collections of it were made from the Comoro Islands, closing the gap in distribution.

GENERIC CLASSIFICATION

There has been a considerable amount of taxonomic confusion about the generic circumscription of the Madagascan representatives of tribe Wielandieae. Webster (1994b: 36) and Radcliffe-Smith (2001: 9) accepted *Blotia*, *Petalodiscus*, and *Wielandia* at generic rank. They erroneously placed in *Savia* s. str. a number of Madagascan species that belong to *Wielandia* s.l., but they did not specify which species they meant. Webster noted that *Blotia* may not be distinct from *Petalodiscus* and drew attention to the monoecy and exalbuminous seeds of both genera. He mentioned section *Afrosavia* under *Savia* but said that it "actually belongs to *Petalodiscus*" (1994b: 36).

In 1998, the authors of this paper published a taxonomic revision of *Blotia* (Hoffmann & McPherson, 1998), recognizing it as a separate genus based mainly on embryo morphology but supported by other morphological characters. Our subsequent discovery of the embryo of *Petalodiscus fadenii* (Radcl.-Sm.) Radcl.-Sm. (Fig. 3G, H) brought up new problems. This embryo was plicate like that of *Blotia* but had a consistently different folding pattern. Other characters of *P. fadenii*, such as the small, caducous stipules and the large (relative to flower size), deeply lobed disc agreed with other *Petalodiscus* species, and others again (such as the pubescent floral disc) were unique in tribe Wielandieae. This once more made the generic boundaries appear doubtful, to the point that we considered raising section *Afrosavia* containing only *P. fadenii* to generic rank.

A single, incomplete specimen further eroded the boundary between *Blotia* and *Petalodiscus* so that we came, somewhat reluctantly, to think that we must subsume the former as a section under the older generic name *Petalodiscus*, thereby uniting all Western Indian Ocean Wielandieae with the exception of *Wielandia elegans* (which is characterized by having a 5-merous ovary) in one genus. The specimen in question (*R. Randrianaivo & R. Bernard 556*, duplicates at K, MO, TAN, US) was collected in 2000 near Antalaha in northeastern Madagascar. It bears dehisced fruit, but no mature seeds and no flowers. There are, however, sufficient characters to identify it as a new species, and it is described below as *W. unifex* Petra Hoffm. & McPherson. It has aspects of both section *Afrosavia* and *Blotia*. It resembles section *Afrosavia* in its long and thin petioles and the long, narrow leaf apex, but the terete petioles, the glabrous, short, alternipetalously lobed disc, and the small spathulate petals recall former *Blotia* species. With regard to leaf areolation, this collection stands between *Blotia* and *Petalodiscus*. No matter what other characters future collections of this taxon bring to light, it seemed clear that *Blotia* and *Petalodiscus* are too closely related to be treated as separate genera.

Finally, molecular phylogenetic studies on Phyllanthaceae (Wurdack et al., 2004; Samuel et al., 2005; Kathriarachchi et al., 2005) showed that *Wielandia elegans*, despite its divergent pentamerous ovary, is also embedded in *Petalodiscus* s.l. and therefore cannot be maintained as a separate monotypic genus if *Petalodiscus* is to be monophyletic. We then decided to unite the entire clade (clade F4b, fig. 3 in Kathriarachchi et al., 2005) including *Blotia* and *Petalodiscus* as *Wielandia* s.l., as circumscribed in this revision. Given the choice between *Petalodiscus* or *Wielandia* as generic name, we chose *Wielandia* because this name has been known in Madagascar throughout its botanical history. The name *Petalodiscus* was used at generic level only three times, all in global synoptic treatments. The first was by Pax (1890: 15), who changed his mind just over 30 years later (Pax & Hoffmann, 1922) to unite both Neo- and Paleotropical species in *Savia*. This view, confusing the genera now called *Savia* and *Wielandia* (sensu Hoffmann et al., 2006), has also been adopted in two more recent treatments by Webster (1994b: 36) and Radcliffe-Smith (2001: 9), who nevertheless also recognized *Petalodiscus* at generic rank. To make a clean break with this confusion and to avoid introducing a new generic name into Madagascan botanical literature, we decided to use the unequivocal name *Wielandia*, which has never been applied to any plant outside the Western Indian Ocean.

Because this generic concept evolved over several years, descriptions of *Wielandia elegans* and the species formerly known as *Blotia* are treated in separate publications (Hoffmann, 1998 and Hoffmann & McPherson, 1998, respectively). For the same reason, *W. elegans* and the newly described *W. unifex* were not included in the detailed leaf and pollen morphological analyses below (the latter is also based on an incomplete specimen). The results of the above molecular analyses also showed that some of the morphologically defined sections are not monophyletic. We therefore decided to discard the sections and to order the species alphabetically (see Appendix 1), while stressing that the five species formerly included in *Blotia* form a homogeneous, easily recognized group within *Wielandia*.

MORPHOLOGY

FLOWERS

The flowers of *Wielandia* show great morphological variety. They are between 1 and 10 mm long and wide, depending on the species. Flowers can be terminal, axillary, and cauline in the same individual. All species are monoecious. The isomerous perianth is well differentiated into calyx and corolla. The petals are half as long to several times longer than the sepals and are yellow, orange, or red in some species. Staminate flowers are generally more delicate than pistillate flowers and tend to have shorter petals relative to the sepals. This is in contrast to other Phyllanthaceae genera, such as *Andrachne* and *Leptopus* Decne., where the petals of pistillate flowers are less developed than those of staminate flowers.

Some taxa, e.g., *Wielandia platyrachis*, have thick petals protecting the flower in bud, whereas in others, e.g., *W. fadenii* (Radcliffe-Smith) Petra Hoffm. & McPherson, the petals are membranous and completely folded into the sepals before anthesis. The petals in *W. platyrachis* (Fig. 1L–N) were incorrectly reproduced in Baillon (1858: t. 22) but noted by Leandri (1958: fig. 20.3), who unfortunately mislabeled them as sepals in the caption (cf. his description on page 119). They have a conspicuous basal thickening on the adaxial surface obscuring the very short disc. There is no indication that these thickenings function as nectaries.

Disc shape and size relative to flower size is variable, extremes being again *Wielandia platyrachis* (Fig. 1L, N), with a disc attaining ca. one seventh the total size of the flower, and the staminate flowers of *W. danguyana* (Leandri) Petra Hoffm. & McPherson (Fig. 1D), with a disc that is about half as long as the entire flower. It is ironic that the first species is the type of *Petalodiscus*, because the genus includes species with much more obvious and elaborate floral discs. The disc lobes, where present, are alternipetalous and sometimes distally emarginate or 2-lobed (Fig. 1A, D, H). Other genera of Phyllanthaceae such as *Andrachne* and *Phyllanthus* L. have alternisepalous disc glands, standing before the petals in *Andrachne*, and in the position of the petals in the apetalous genus *Phyllanthus*.

The varied disc morphology displayed by the species of *Wielandia* prompts the question whether the disc of Euphorbiaceae s.l. is derived from an intrastaminal whorl of floral organs, or whether it is of a receptacular nature. This debate was summarized by Webster (1994a: 11), with the conclusion that the available evidence favors the latter hypothesis. In fact, none of the disc glands of *Wielandia* could, on close examination, be mistaken for petals or staminodes in texture or shape. Elaborate receptacular nectaries are known from other families, e.g. Passifloraceae and Rutaceae (Weberling, 1989: 22, 195).

The androecium of *Wielandia* is isomerous with the perianth, and the stamens are alternipetalous. The

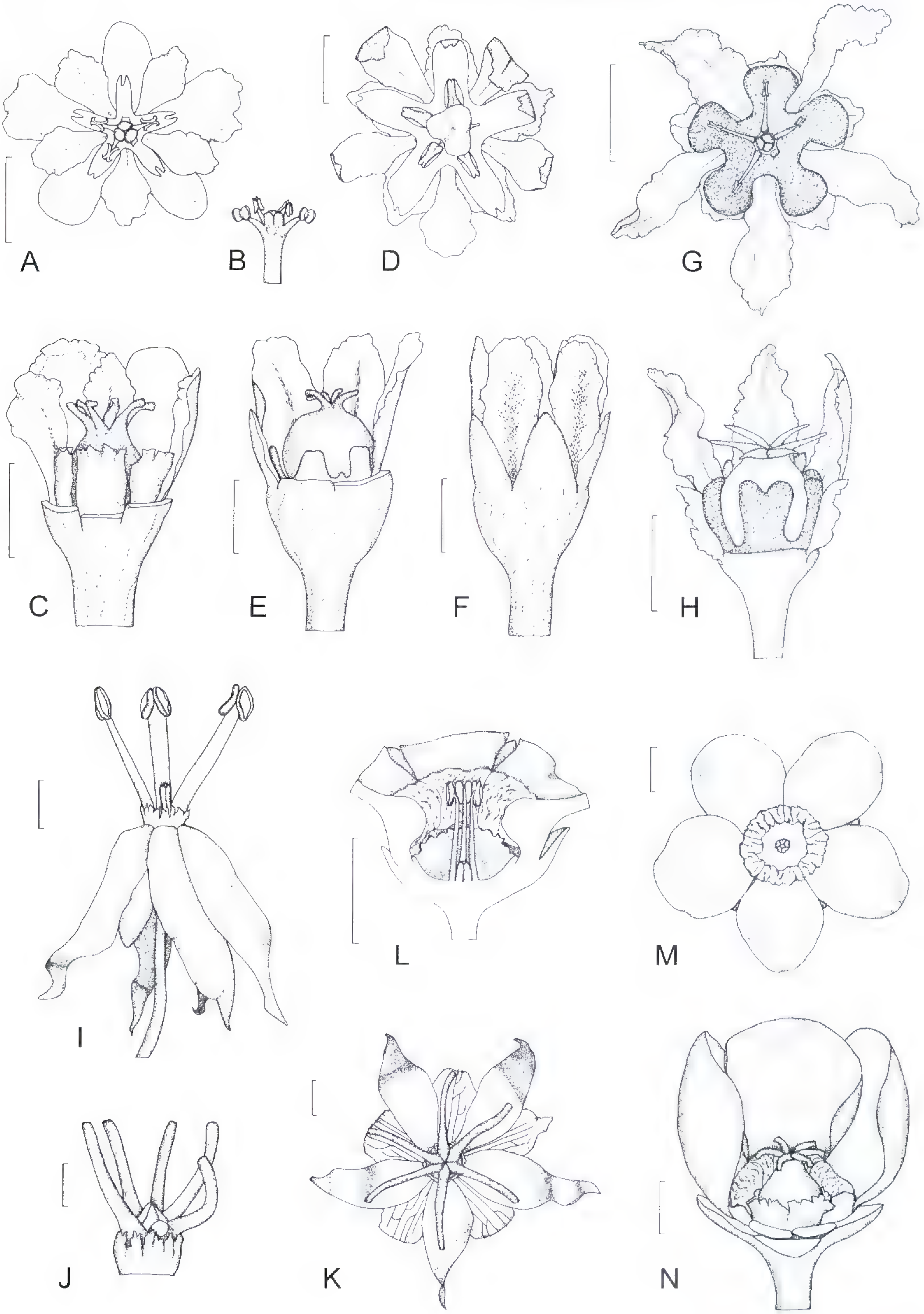

Figure 1. Flowers of *Wielandia*. A–C. *W. laureola*. —A. Staminate flower. —B. Androecium. —C. Pistillate flower, parts of perianth removed. D–F. *W. danguyana*. —D. Staminate flower. —E. Pistillate flower, parts of perianth removed. —F. Pistillate flower. G, H. *W. fadenii*. —G. Staminate flower. —H. Pistillate flower, parts of perianth removed. I–K. *W. bojeriana*. —I. Staminate flower, two stamens removed. —J. Disc and gynoecium with conical center. —K. Pistillate flower. L–N. *W. platyrachis*. —L. Staminate flowers, longitudinal section, petals cropped. —M. Staminate flower. —N. Pistillate flower, parts of perianth removed. A, B, *Schatz & Lowry 1303* (K); C, *Capuron 22083-SF* (P); D, *Gouvernement de Madagascar 59* (P); E, F, *Service Forestier 5728* (P); G, H, *Capuron et al. 2312* (P); I, *Rakotoniaina 11712-RN* (P); J, *Humbert 19759* (P); K, *Cours 710* (P); L–N, *Capuron 22908-SF* (P). Scale bars = 1 mm. Drawn by Petra Hoffmann.

Table 1. Pollen characters of *Wielandia* 1: species with plicate cotyledons. Colpi length is measured as absolute (abs.) and as a percentage of the polar axis (%). *W. fadenii: Randrianamera 89-RN* (P); *W. bemarensis: DuPuy, DuPuy & Raharilala MB372* (K); *W. mimosoides: Cours 4716* (P); *W. oblongifolia: Thourenot 1918* (K); *W. tanalorum: Humbert & Capuron 24041* (K).

	W. fadenii	*W. bemarensis*	*W. mimosoides*	*W. oblongifolia*	*W. tanalorum*
Pollen shape	spheroidal	spheroidal	spheroidal	spheroidal	spheroidal
Polar axis (μm)	19–22	17–22	20–23	21–25	22–27
Equator (μm)	17–23	17–24	22–25	20–25	22–30
Polar axis : equatorial axis	0.9–1.2	0.8–1.1	0.9–1.0	0.9–1.1	0.9–1.1
Colpi, length (abs.) (μm)	14–20	9–15	11–16	14–17	15–17
Colpi, length (%)	67–95	50–68	52–73	62–74	62–71
Exine sculpture	tectate-perforate	eureticulate	eureticulate	eureticulate	eureticulate
Width of lumina (μm)	0.5–0.7	1–2	1–2	1–2	1–2
Exine thickness at mesocolpium (μm)	1–1.5	1–2	1.5–2	1–2	1–2

filaments are fused to varying degrees in *W. elegans*, *W. laureola* (Baill.) Petra Hoffm. & McPherson, *W. ranavalonae* (Leandri) Petra Hoffm. & McPherson, and in the former *Blotia* species, and free in the remaining four species where staminate flowers are known. The anthers are free in all species. In *W. elegans* and *W. platyrachis*, the anthers are reflexed outward and pendulous, giving them a very similar appearance despite the fact that the first has connate and the latter free filaments. The anthers of *W. tanalorum* (Leandri) Petra Hoffm. & McPherson, and to a lesser extent, *W. oblongifolia* (Baill.) Petra Hoffm. & McPherson, are also reflexed, but their filaments are partly fused. *Wielandia bojeriana* (Baill.) Petra Hoffm. & McPherson is conspicuous in having long, thick filaments that are widely exserted from the reflexed perianth (Fig. 1I). This may indicate a pollination syndrome different from that of the other species, where the stamens are short and not exserted. No observations have been recorded as to the pollinators of *Wielandia*. There is a small pistillode inside the staminal whorl.

With the exception of 5-locular *Wielandia elegans*, all species have uniform 3- (rarely 4-) locular, glabrous ovaries with free, acute styles that are bifid to the base. In *W. bojeriana*, the styles are exceptionally long and terete, matching the stamens in length.

POLLEN

A number of palynological surveys including some species of *Wielandia* have been published (Punt, 1962; Köhler, 1965; Muller et al., 1989). Pollen characters vary significantly between species, and original observations from this study are summarized in Tables 1 and 2. The largest pollen grains are found in *W. bojeriana* and *W. platyrachis* (Fig. 2A, B), whereas *W. danguyana* and *W. fadenii* (Fig. 2E, F) have the smallest pollen. *Wielandia fadenii* (Fig. 2D) and *W. danguyana* differ from the remaining species of *Wielandia* (Fig. 2C; Punt, 1987: 132; Muller et al., 1989: 68, 81) in having tectate-perforate pollen grains. *Wielandia elegans*, *W. platyrachis*, and the former *Blotia* species furthermore have short colpi relative to the polar axis, whereas *W. danguyana* and *W. fadenii* have much longer colpi. *Wielandia bojeriana* and *W. laureola* stand between the two groups, resembling *W. danguyana* and *W. fadenii* in colpus length, and *W. elegans*, *W. platyrachis*, and the former *Blotia* species in exine sculpture. Pollen of *W. ranavalonae* was not studied because of the scarcity of staminate material. *Wielandia leandriana* (Petra Hoffm. & McPherson) Petra Hoffm. & McPherson was recognized after conclusion of the pollen study, but all other former *Blotia* species are palynologically similar, and by morphological inference, *W. leandriana* can be expected to resemble them closely.

FRUITS AND SEEDS

Fruit morphology in *Wielandia* is uniform with the exception of the 5-locular *W. elegans*. The typical euphorbiaceous schizocarps of all other species (Figs. 3A; 11A, D) are 3-locular, or very rarely 2- or 4-locular. Tension in the drying pericarp at fruit maturity results in explosive septicidal, loculicidal, and septifragal dehiscence into three or six valves. During dehiscence, the septa tear irregularly and often in several places (Fig. 3A). A slim, basally and apically only slightly dilated columella remains on the plant, along with the perianth and disc (Fig. 3D). Only *W. ranavalonae* has distally more strongly thickened columellae, which correspond to its unusual seed shape (Fig. 14C). *Wielandia bojeriana* and *W. laureola* appear to have a slightly fleshy mesocarp, whereas the

Table 2. Pollen characters of *Wielandia* 2: species with thick cotyledons (unknown in *W. laureola*). Colpi length is measured as absolute (abs.) and as a percentage of the polar axis (%). *W. bojeriana: Humbert 20770* (P); *W. danguyana: Service de Colonisation (Randrianasolo coll.) 59* (K); *W. laureola: Dorr 4415* (K); *W. platyrachis: Capuron 22897-SF* (P). Pollen of *W. ranavalonae* was not studied because of the scarcity of staminate material.

	W. bojeriana	*W. danguyana*	*W. laureola*	*W. platyrachis*
Pollen shape	spheroidal	spheroidal	oblate (but also spheroidal in Muller et al., 1989: 81)	spheroidal
Polar axis (μm)	25–29	15–19	20–23	22–27
Equator (μm)	25–33	15–17	23–26	24–30
Polar axis : equatorial axis	0.8–1.2	0.9–1.2	0.8–0.9	0.8–1.1
Colpi, length (abs.) (μm)	21–25	15–19	15–19	11–15
Colpi, length (%)	72–89	94–100	71–90	45–55
Exine sculpture	eureticulate	tectate-perforate	eureticulate	eureticulate
Width of lumina (μm)	2–3	0.5	1–1.5	2
Exine thickness at mesocolpium (μm)	2–3	1–1.5	2	2

outer layer of the pericarp in all other species is macroscopically undifferentiated. The dehiscence mechanism, however, does not seem to vary.

The anatropous ovules develop into more or less campylotropous seeds, whereby micropyle and hilum stay adjacent to each other. Seeds are only rarely found on herbarium material, and mature seeds of *Wielandia laureola* are still unknown. There are one or two smooth, usually sub-ovoid seeds per locule. In *W. bojeriana*, *W. elegans*, *W. platyrachis*, and the former *Blotia* species, the seeds are apiculate at the micropylar pole and have a more or less distinct, prominent, often slightly undulating ring-like structure surrounding the chalaza (Fig. 3E, F). No part of the seed is fleshy, and the prominent area resembles the rest of the seed coat in texture. This structure is here referred to as the perichalazal annulus. In *W. danguyana*, the seeds are nearly lens-shaped (Fig. 13C–E), and in *W. ranavalonae*, they are globose to ellipsoid (Figs. 3B, C; 14C), lacking an apiculum in both species. The seeds of *W. ranavalonae* also have a conspicuously large hilum in the center of the ventral face, and a micropyle that is not terminal as in all other species but positioned laterally directly above the large hilum.

Embryo characters are more varied in *Wielandia* than in any other genus of Euphorbiaceae s.l. Exalbuminous seeds like those of *Wielandia* are found in several tribes of Phyllanthaceae (Hoffmann et al., 2006) but are rare in the remaining euphorbiaceous families. Most *Wielandia* species have thick, roughly hemispherical cotyledons (Figs. 3B, C, I; 13D, E). The exact shape of the cotyledons depends on the shape of the seed. *Wielandia ranavalonae* is aberrant in having a lateral instead of a terminal radicle (Fig. 3B, C). *Wielandia fadenii* has thin, plicate cotyledons (Fig. 3G, H). These are similar to those of former *Blotia* species (Hoffmann & McPherson, 1998: fig. 3E), but the folding pattern (which is identical in all examined seeds of *Blotia*) differs consistently from that in *Wielandia fadenii*. Plicate cotyledons occur also in *Discocarpus* Klotzsch and *Lachnostylis* Turcz. (Stuppy, 1996: t. 50B and 52B, respectively), as well as in some species of *Actephila* Blume (Baillon, 1866: t. 10.6, 10.7). Each of those genera seems to have a different folding pattern of the cotyledons.

LEAF MORPHOLOGY AND VENATION

General leaf morphology in *Wielandia* is both unspecialized and variable. Length of mature leaves in *W. bojeriana*, for example, ranges from 1 to 16 cm. The leaves lack specialized trichomes, glands (apart from the glandular tip of the midvein in some species), marginal teeth, and domatia. Only two of the species have a sparse leaf indumentum, and all others are glabrous. The stipules provide a useful character to distinguish the former *Blotia* species from all other taxa. *Blotia* stipules are persistent and at least 2 mm long, whereas those of all other species are small and caducous. Another diagnostically useful character is that the midvein is more or less prominent in all species but *W. danguyana*, where it is distinctly impressed (Fig. 6I).

Leaf venation of Phyllanthaceae (as Phyllanthoideae) has been studied by Levin (1986) and, far less analytically, by Klucking (1997). The former examined

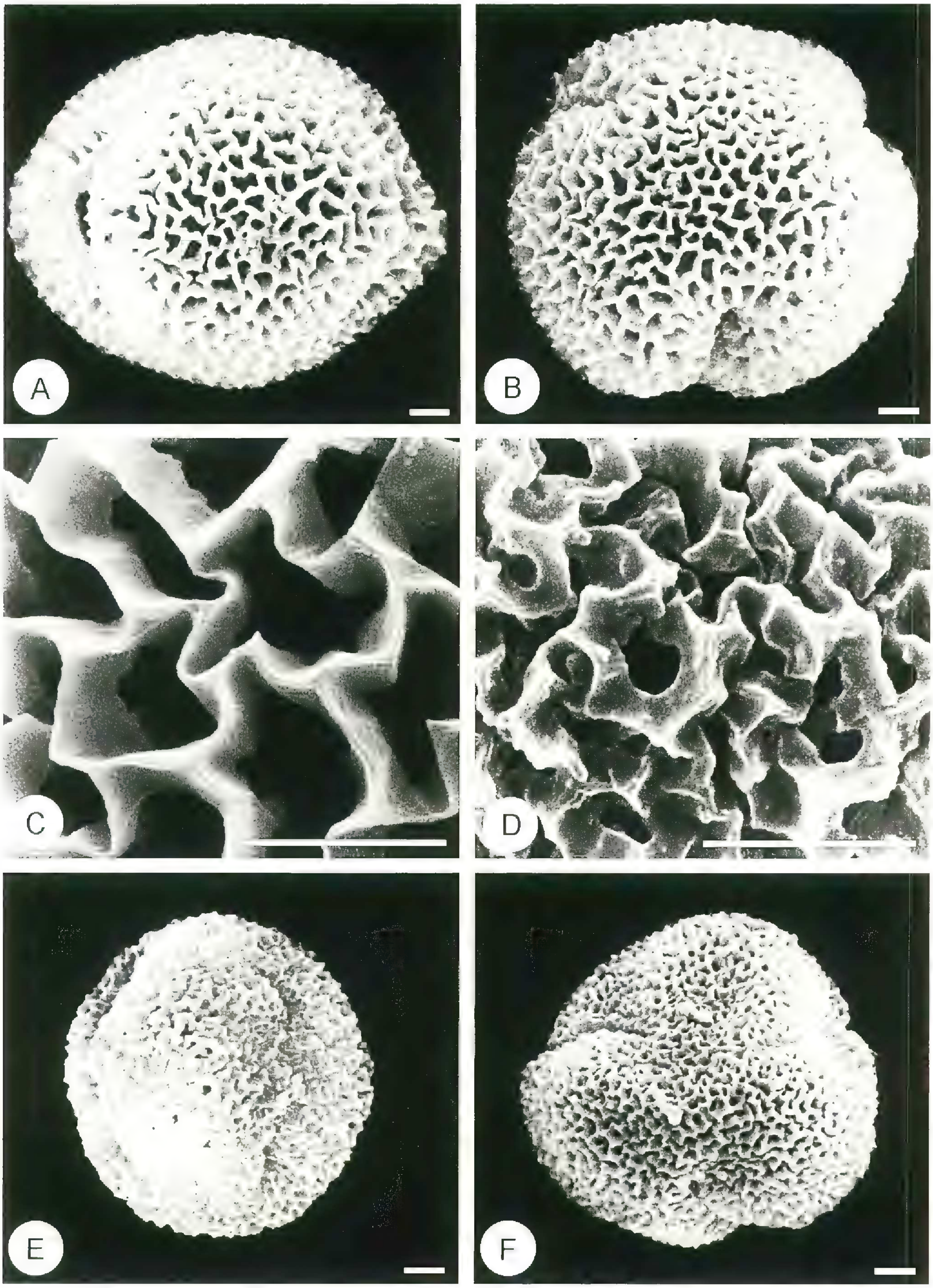

Figure 2. Pollen of *Wielandia*. A–C. *W. platyrachis*. —A. Equatorial view. —B. Polar view. —C. Detail of apocolpium. D–F. *W. fadenii*. —D. Detail of mesocolpium. —E. Equatorial view. —F. Polar view. A–C, *Capuron 22897-SF* (P); D–F, *Randrianamera 89-RN* (P). Scale bars = 2 µm.

Wielandia danguyana, *W. elegans*, and *W. oblongifolia*, whereas the latter included only *W. elegans*. The basic venation type of *Wielandia* leaves is brochidodromous, as in the majority of Phyllanthaceae (Levin, 1986: 39). Marginal ultimate venation, areolation, course of the secondary veins, and shape of intercostal fields, however, vary considerably in the genus. For terminology and categories used here, see Hickey (1979). The marginal ultimate venation of *W. bojeriana* and *W. ranavalonae*, and to a lesser degree *W. elegans* and *W.*

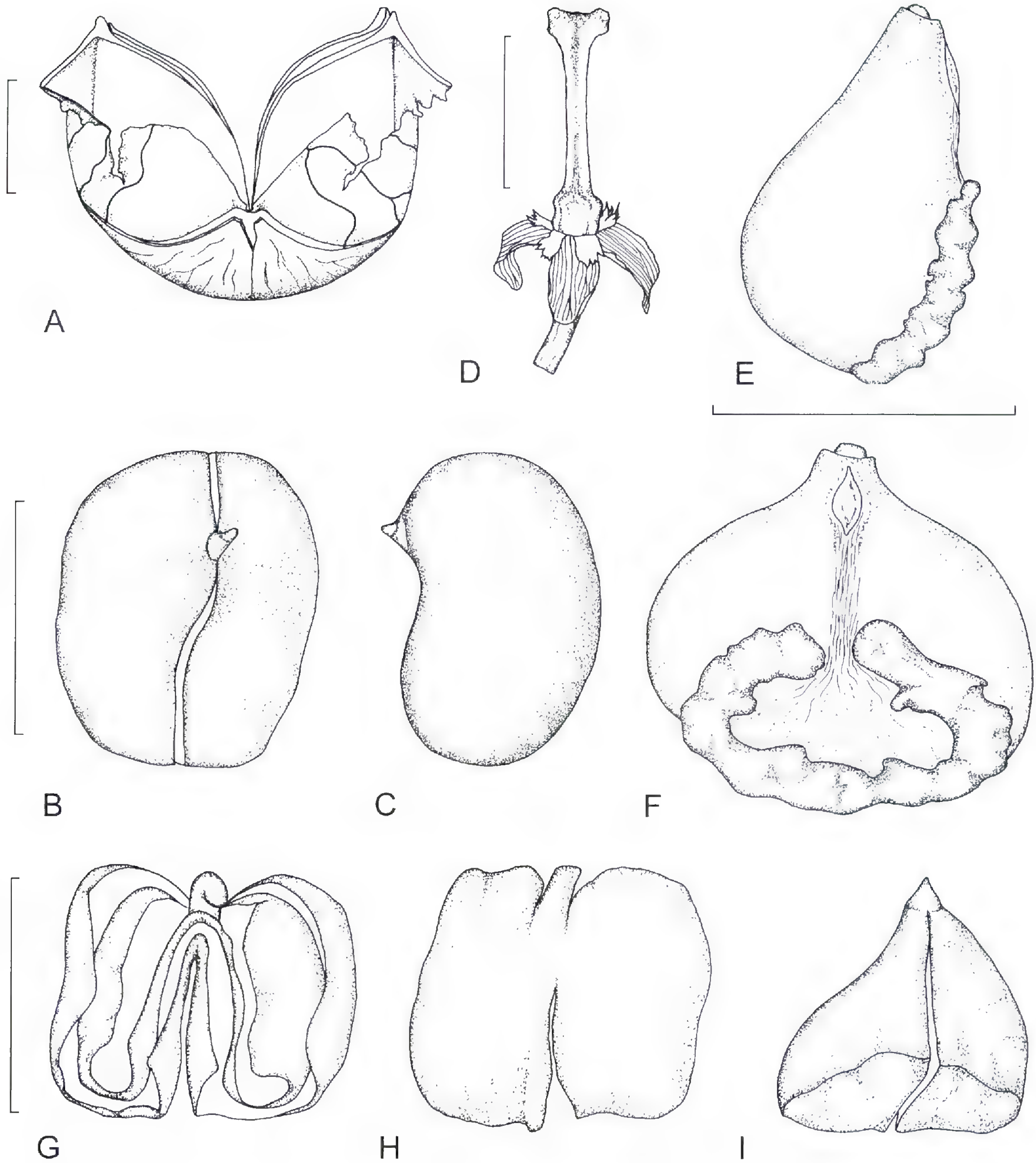

Figure 3. Fruits and seeds of *Wielandia*. A–C. *W. ranavalonae*. —A. Mericarp. —B. Embryo from 1-seeded locule in ventral view. —C. Same embryo in lateral view. D–F. *W. bojeriana*. —D. Columella with persistent perianth and disc. —E. Seed from 1-seeded locule in lateral view. —F. Same seed in ventral view. G, H. *W. fadenii*. —G. Embryo from 1-seeded locule in ventral view. —H. Same embryo in dorsal view. —I. *W. platyrachis*, embryo from 1-seeded locule in ventral view. A, *Capuron 20586-SF* (P); B, C, *Bosser 9070* (P); D, *Humbert 19759* (P); E, F, *Rabevohitra 2130* (K); G, H, *Leandri 2286* (P); I, *Service Forestier 13196* (P). Scale bars = 5 mm. Drawn by Petra Hoffmann.

platyrachis, is possibly their most interesting leaf venation character and appears to be unique at least in Phyllanthaceae. It does not seem to have been recorded before, and it warrants a new (sub)type in Hickey's (1979: 36) classification, as it is not comparable to his figures 102 or 104. We suggest that this type of marginal venation be called "exmedial." Levin also qualified the description of the marginal venation in *Wielandia* as "incomplete, veins thickened and heavily sclerified, flaring toward the margin" (1986: 40), whereas in other taxa it is simply described as "incomplete," often in conjunction with "looped." For this study, leaves from herbarium material were cleared over several weeks to months in 10% NaOH, and were briefly cleared further in 10% NaOCl. They were then stained in an alcohol solution of safranine,

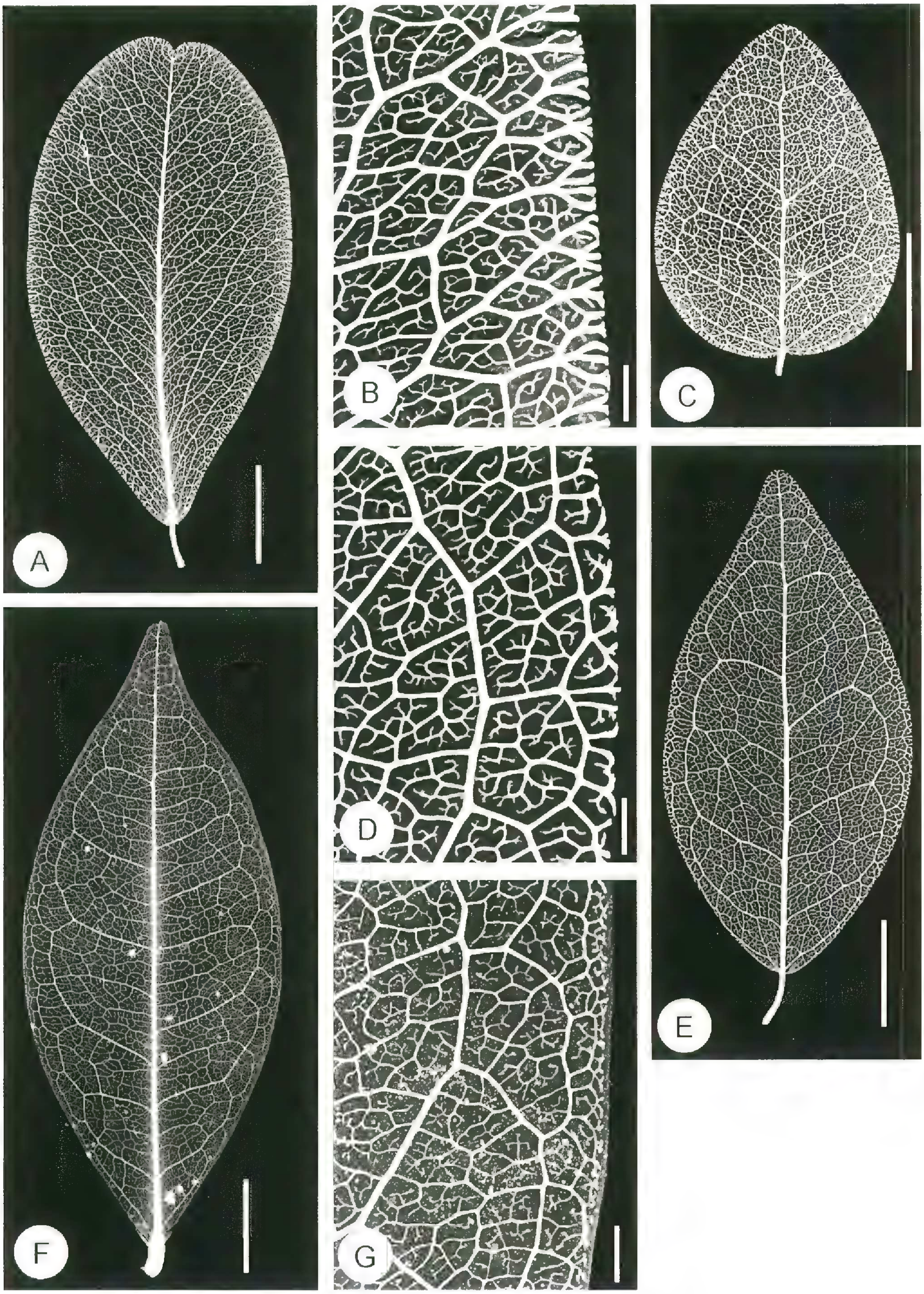

Figure 4. Leaf venation of *Wielandia* I, from cleared leaf material. —A, B. *W. ranavalonae*. —C. *W. bojeriana*. —D, E. *W. laureola*. —F, G. *W. platyrachis*. A, B, *Bosser 9070* (P); C, *Capuron 28582-SF* (P); D, E, *Decary 6569* (US); F, G, *Capuron 23828-SF* (P). Scale bars = 1 cm in A, C, E, F; 1 mm in B, D, G.

and mounted in Canada balsam. Leaves from several specimens of each taxon were examined in this way. The photographs were taken directly from the slides onto photographic paper (without film).

The former *Blotia* species form a distinct and uniform group with respect to leaf venation that is characterized by regularity in both lower and higher order venation (Fig. 5E–H). In the remaining species

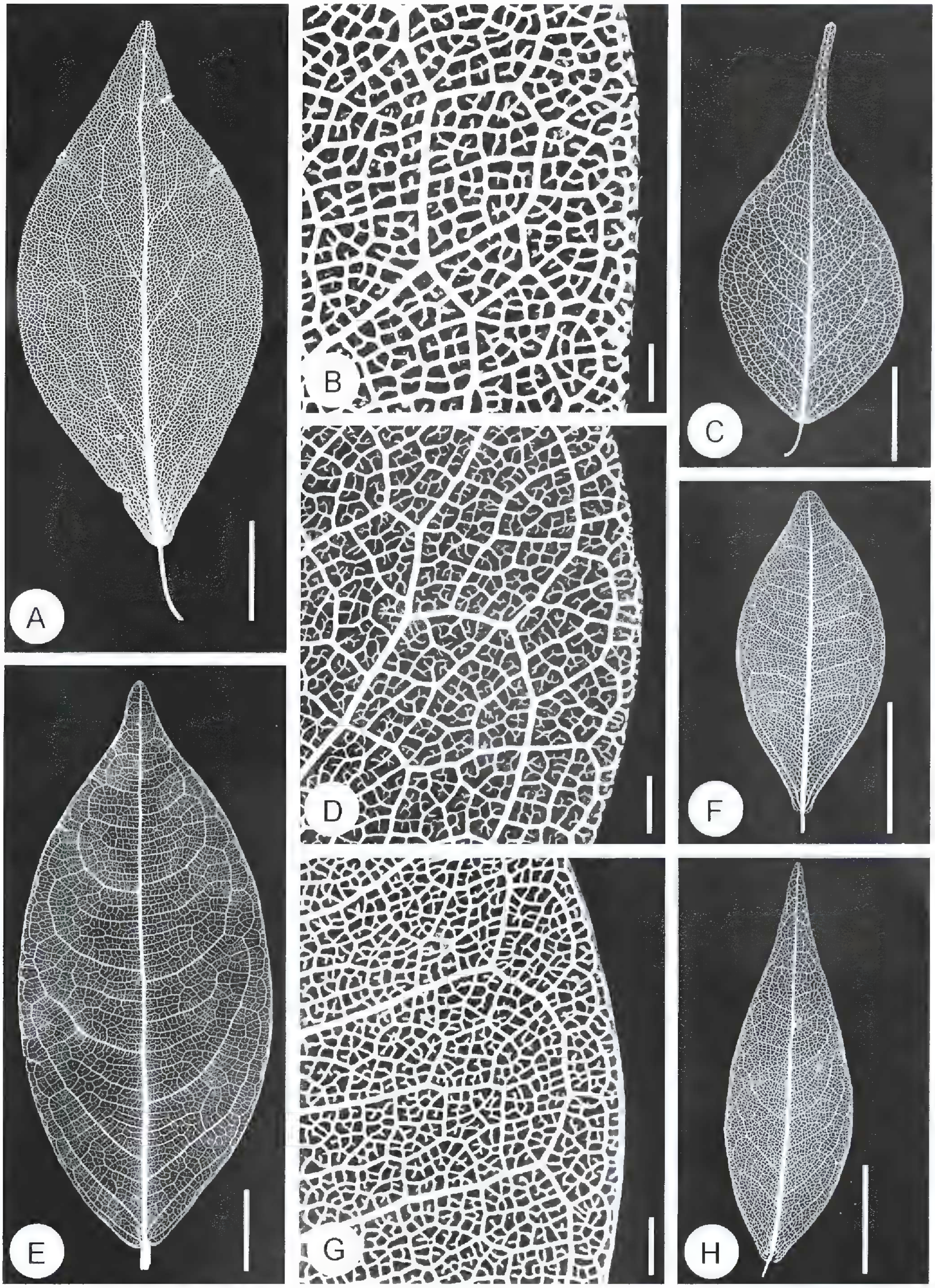

Figure 5. Leaf venation of *Wielandia* 2, from cleared leaf material. —A, B. *W. danguyana.* —C, D. *W. fadenii.* —E. *W. tanalorum.* —F, G. *W. mimosoides.* —H. *W. bemarensis.* A, B, *Capuron 11964-SF* (P); C, D, *Randrianamera 89-RN* (P); E, *Decary 5104* (K); F, G, *Thouvenot 131* (US); H, *Service Forestier 9383* (P). Scale bars = 1 cm in A, C, E, F, H; 1 mm in B, D, G.

examined in detail in this study, three groups can be distinguished: *Wielandia danguyana* (Fig. 5A, B) and *W. fadenii* (Fig. 5C, D) show irregular lower order venation, but highly organized higher order venation. The venation of *W. bojeriana* (Fig. 4C) and *W. ranavalonae* (Fig. 4A, B) generally has a low degree of organization, with highly specialized marginal ultimate venation. Finally, *W. laureola* (Fig. 4D, E) and *W. platyrachis* (Fig. 4F, G) have very regular secondary venation contrasted with relatively unorganized higher venation.

The former *Blotia* species (Fig. 5F–H) have the most regular venation in *Wielandia*, and probably of all Phyllanthaceae. The areolation is so perfect as to resemble graph paper, with most areoles less than 0.2 mm in diameter. A similarly perfect areolation is only found in *W. danguyana*, but there the lower order venation is highly irregular (Fig. 5A, B). The former *Blotia* species have a very regular lower order venation with five to 11 secondary veins that are rounded and delimit intercostal fields of regular size and shape. The secondary veins are surrounded usually by two rows of outer loops (sometimes only one in the small-leaved *W. mimosoides* and sometimes three in *W. tanalorum*). There are long, simple (as opposed to composite), and often unbranched intersecondary veins, and tertiary veins are as a rule orthogonally reticulate, and more rarely (in the small-leaved *W. bemarensis* (Leandri) Petra Hoffm. & McPherson and *W. mimosoides*) also randomly reticulate. Marginal ultimate venation in this group represents one extreme in the genus, the other being *W. bojeriana* and *W. ranavalonae* (Fig. 4B). Only in the former *Blotia* species is the predominantly looped marginal venation sometimes partly or fully (in the large-leaved *W. oblongifolia*) fused and straightened into a fimbrial vein of the fourth order (Fig. 5G). *Wielandia oblongifolia* also lacks veinlets ending freely in the margin, which are present in varying degrees in the remaining former species of *Blotia* but never as prominent as in other *Wielandia* species. Generally speaking, differentiation and organization of leaf venation in the former genus *Blotia* decreases with decreasing leaf size, whereas it is more species-dependent in the remaining species of *Wielandia*.

Levin (1986: 43, figs. 16, 17), in his survey of foliar morphology of Phyllanthoideae, chose *Wielandia danguyana* to represent the genus *Petalodiscus* and remarked on the "unusual combination of relatively disorganized lower order venation with highly differentiated orthogonal higher order venation forming oriented, but still imperfect areoles" that he compared to *Discocarpus* (where this is less pronounced than in *W. danguyana*). *Wielandia danguyana* (Fig. 5A, B) has only four or five pairs of secondary veins, which are abruptly curved, barely extend halfway toward the leaf margin, and are surrounded by two to four rows of outer loops. The tertiary veins, on the other hand, are orthogonally reticulate, and the areoles well-developed, oriented, usually tetragonal and small to medium sized. A similarly perfect areolation is only found in the former *Blotia* species, where it is combined with a very regular lower order venation (Fig. 5E–H). The marginal ultimate venation is made up of short and thick freely ending veins with some loops. *Wielandia fadenii* (Fig. 5C, D) shows a similar but less extreme discrepancy between the different venation orders. The four to six pairs of secondary veins enclose irregular intercostal fields and are surrounded by two or three rows of outer loops. All other species, except for *W. danguyana* and *W. tanalorum*, have only one or two rows of outer loops. As in *W. danguyana*, the tertiary veins are orthogonally reticulate in *W. fadenii*, but with a slightly less organized areolation. Apart from the former *Blotia* species, *W. fadenii* shows the most pronounced looped marginal ultimate venation in the genus, with other veinlets ending freely in the margin.

The venation of *Wielandia bojeriana* (Fig. 4C) and *W. ranavalonae* (Fig. 4A, B) is of a low degree of organization and is remarkable for its conspicuously sclerified marginal ultimate venation consisting of parallel, exmedially branched free-ending veins. This can be seen on most uncleared, dried leaves in herbarium material and is an excellent diagnostic character. It is in stark contrast to leaves in former *Blotia* species and, more so, to those of West Indian *Savia* section *Heterosavia*, e.g., *S. maculata* Urb., where the marginal venation is united to form a strong fimbrial vein (P. Hoffmann, 2008). *Wielandia bojeriana* and *W. ranavalonae* have nerves thicker than average in all nerve orders. The six to 12 pairs of secondary veins are abruptly curved distally in *W. ranavalonae*, enclosing irregularly shaped intercostal fields, whereas they are rounded in *W. bojeriana*, and the intercostal fields are of a regular shape. In this, *W. ranavalonae* is more similar to *W. danguyana* and *W. fadenii*. The tertiary veins are randomly reticulate in both *W. bojeriana* and *W. ranavalonae*, and the higher venation has a tendency toward incompletely closed meshes that are randomly oriented, irregularly shaped, and medium to large.

In *Wielandia laureola* (Fig. 4D, E), a very regular lower venation with intercostal fields of nearly the same size is contrasted with unorganized higher venation. The tertiary veins of *W. laureola* are randomly to orthogonally reticulate, but the areolation is imperfect, with a tendency to incompletely closed, randomly oriented, irregularly shaped, medium to large meshes as in the two previous taxa. The marginal ultimate veins are again exmedially branching free-ending veins, but are neither parallel nor as conspicuously thickened as in *W. bojeriana* and *W. ranavalonae*. The venation of *W. platyrachis* (Fig. 4F, G) and *W. elegans* (see also Levin, 1986: 40, figs. 1, 2), finally, resembles *W. laureola* in general organization. It differs from all other species except those of the former *Blotia* species in having usually simple (as opposed to composite), long, and unbranched intersecondary veins that can resemble the secondary veins in course and thickness. Tertiary veins and areolation are similar in degree of organization to those of *W. bojeriana* and *W. ranavalonae*, but the higher venation is very thin compared to the midvein. The only notable sclerenchymatic thickening of the higher venation is found in the ultimate veinlets, which again end freely in the leaf margin or in the areoles.

LEAF ANATOMY

Leaf anatomy in *Wielandia* is as diverse as leaf venation. The most important characters are vascularization of the petiole, sclerification of the vascular bundles in the leaf blade, course of the anticlinal walls in the epidermis, and development of stomatal ledges.

Cross sections were obtained by softening petioles and leaf fragments from herbarium material for ca. seven days in equal parts of glycerin, 96% ethanol, and distilled water (Strassburger's mixture), and sectioning at 10–25 µm with a freezing microtome. Petiolar cross sections were made at three points for each sample: at the base, in the middle, and distally just below the base of the leaf blade. To examine the epidermis, leaf fragments were macerated in Schulze's mixture ($KClO_3$ + 60% HNO_3) and 25% ammonia, and cleaned mechanically. All were stained with aqueous solutions of safranine or toluidine blue and mounted in glycerin jelly. Measurements were taken from slides prepared from different herbarium samples. Leaf surfaces were sputtered with gold and photographed (150–4000×) in SEMs at three different academic institutions in Berlin (Germany).

Basic leaf anatomy is typical for most dicots (Fig. 6J–L): bifacial, hypostomatic, with a one-layered epidermis, lacking a hypodermis, and more or less strongly sclerenchymatic or collenchymatic vascular sheaths. Trichomes are rare and, if present, are unbranched, unicellular, or uniseriate. Epicuticular wax can be copious to lacking in the same species. It regularly occurs only in *Wielandia fadenii*, where it is concentrated around the stomata (Fig. 9E). The cuticle is smooth or folded, and the epidermal cells are polygonal, irregularly shaped and oriented, and usually tabular. Anticlinal walls are undulating in *W. fadenii* (Fig. 7E), straight in all other species. Other leaf anatomical characters are summarized in Tables 3 and 4. Noteworthy is the two- to four-layered palisade of *W. platyrachis* (Fig. 6K), which consists of isodiametric cells and therefore is of about the same thickness as in the species with one or two palisade layers consisting of elongated cells.

Stomata type represents one of the most significant differences between Neotropical species of *Savia* s.l. and *Gonatogyne* on the one hand, and *Wielandia* (Fig. 7) on the other. The Neotropical taxa have paracytic stomata, whereas those in *Wielandia* are cyclocytic with three to six subsidiary cells (Fig. 7). The term cyclocytic is normally used only for stomata with four or more subsidiary cells. Stomata surrounded by three cells are called anisocytic, assuming that one subsidiary cell is smaller than the other two (Wilkinson, 1979: 100). This distinction is not justified for *Wielandia*, where there are usually three or four, and up to six subsidiary cells in the same individual, all of which can be of roughly equal size or of different sizes without following a particular pattern. Therefore, all stomata with three or more subsidiary cells are here called cyclocytic. These results are not congruent with those of Levin (1986: 33, 40–43), who indicated paracytic stomata in *W. elegans*, *W. danguyana* (as *Petalodiscus*), and *W. oblongifolia* (as *Blotia*). "Water stomata," recorded by Levin (1986: 39, 55) only for some species of *Andrachne*, were found in five of the 11 *Wielandia* species examined (e.g., *W. fadenii*, Fig. 7E).

There are considerable differences in shape and size of the stomata, *Wielandia platyrachis* and *W. ranavalonae* having much larger stomata than the remaining species (Tables 3, 4). More remarkable are the differences between the stomata of the individual species in cross section (Fig. 8). The species can be divided into three groups with regard to the development of the stomatal ledges: in *W. bojeriana* (Fig. 8C) and *W. platyrachis* (Fig. 8D), both outer and inner stomatal ledges are developed. In *W. fadenii* (Fig. 8B), *W. danguyana* (Fig. 8G), and *W. laureola* (Fig. 8F), as well as in the former *Blotia* species (Fig. 8A), only the outer stomatal ledge is developed. And finally in *W. ranavalonae* (Fig. 8E), stomatal ledges are absent. The guard cells of *W. danguyana* (Fig. 8G) and *W. laureola* (Fig. 8F), including the cuticular membrane, appear solid in light microscopy. The different shapes of the stomatal apparatus result in distinctive patterns that are confirmed in SEM (Fig. 9). These range from papillose subsidiary cells obscuring the aperture in *W. fadenii* (Figs. 8B, 9E), over outer stomatal rims in *W. bojeriana* (Figs. 8C, 9A) and *W. platyrachis* (Figs. 8D, 9B), to a mainly cuticular peristomatal rim in *W. ranavalonae* (Figs. 8E, 9F). *Wielandia danguyana* (Figs. 8G, 9D) and *W. laureola* (Figs. 8F, 9C) show a combination of the latter two states. In the former *Blotia* species, all transitions from papillose subsidiary cells (Fig. 9H) to pronounced outer stomatal rims (Fig. 9G) were observed. These characters identify *Wielandia* species by their stomata alone. They have been shown to be systematically

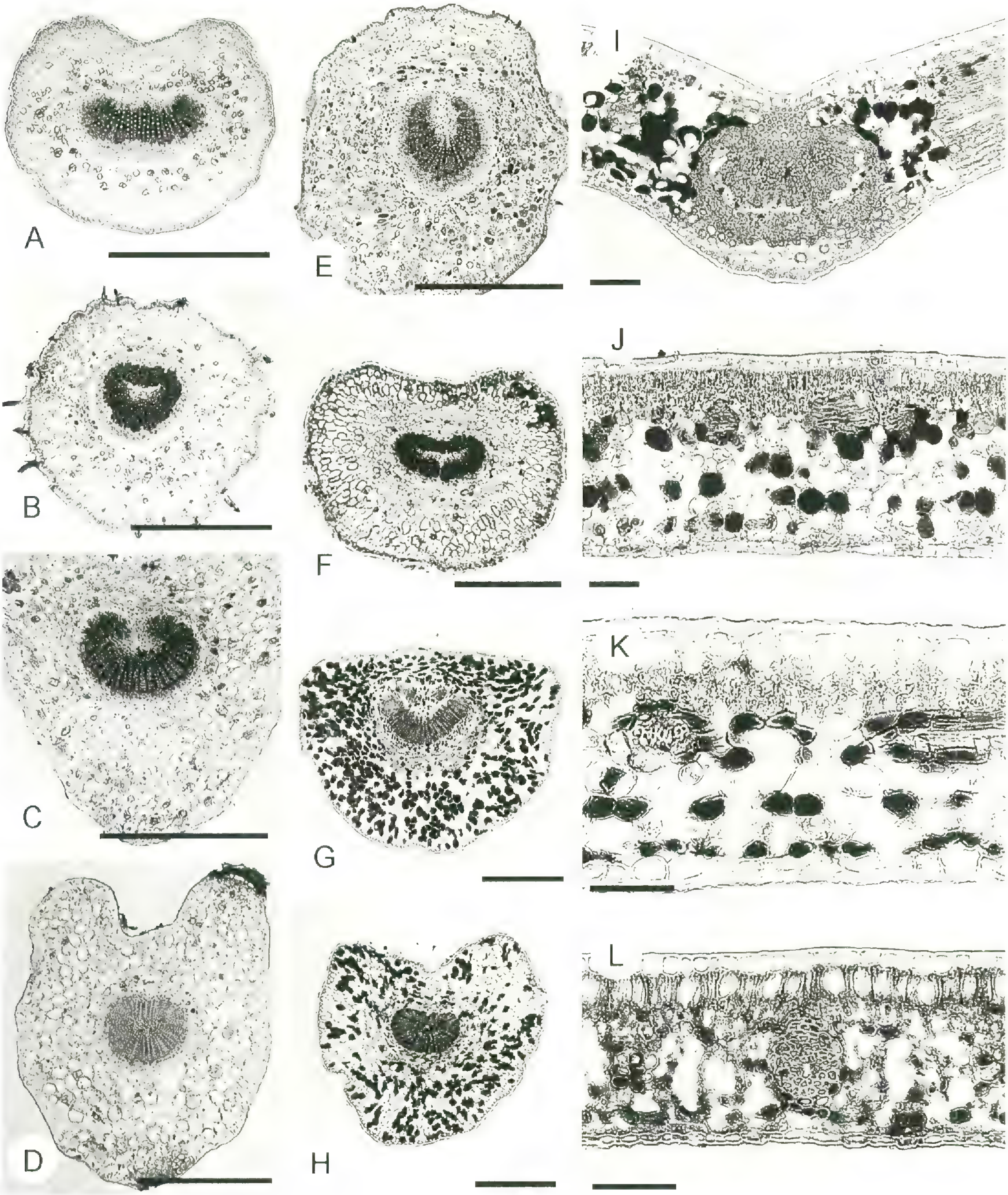

Figure 6. Leaf anatomy of *Wielandia*, petiole and leaf blade cross sections. —A. *W. fadenii*, middle of petiole. —B. *W. bojeriana*, middle of petiole. C, D. *W. platyrachis*. —C. Base of petiole. —D. Apex of petiole. —E. *W. danguyana*, base of petiole. —F. *W. ranaralonae*, middle of petiole. G, H. *W. laureola*. —G. Base of petiole. —H. Apex of petiole. —I. *W. danguyana*, midvein with subepidermal sclerenchyma. —J. *W. ranaralonae*, leaf blade. —K. *W. platyrachis*, leaf blade with isodiametric palisade cells. —L. *W. oblongifolia*, leaf blade. A, *Randrianamera 89-RN* (P); B, *Capuron 28582-SF* (P); C, D, *Capuron 23581-SF* (P); E, I, *Schlieben 8120* (G); F, J, *Capuron 20586-SF* (P); G, H, *Decary 6569* (US); K, *Capuron 11793-SF* (P); L, *Decary 6389* (P). Scale bars = 0.5 mm in A–H; 0.1 mm in I–L.

significant in other plant families at the species, sectional, and genus level (Wilkinson, 1979: 107).

The last anatomical leaf blade character to be discussed is also apparent macromorphologically. In all species, the midvein is surrounded by a sclerenchymatic sheath or cap. In 10 of the 11 species examined, these in turn are surrounded by collenchyma fibers abaxially, and collenchyma fibers and/or palisade cells adaxially. This adaxial layer of collenchyma and/or palisade cells is responsible for

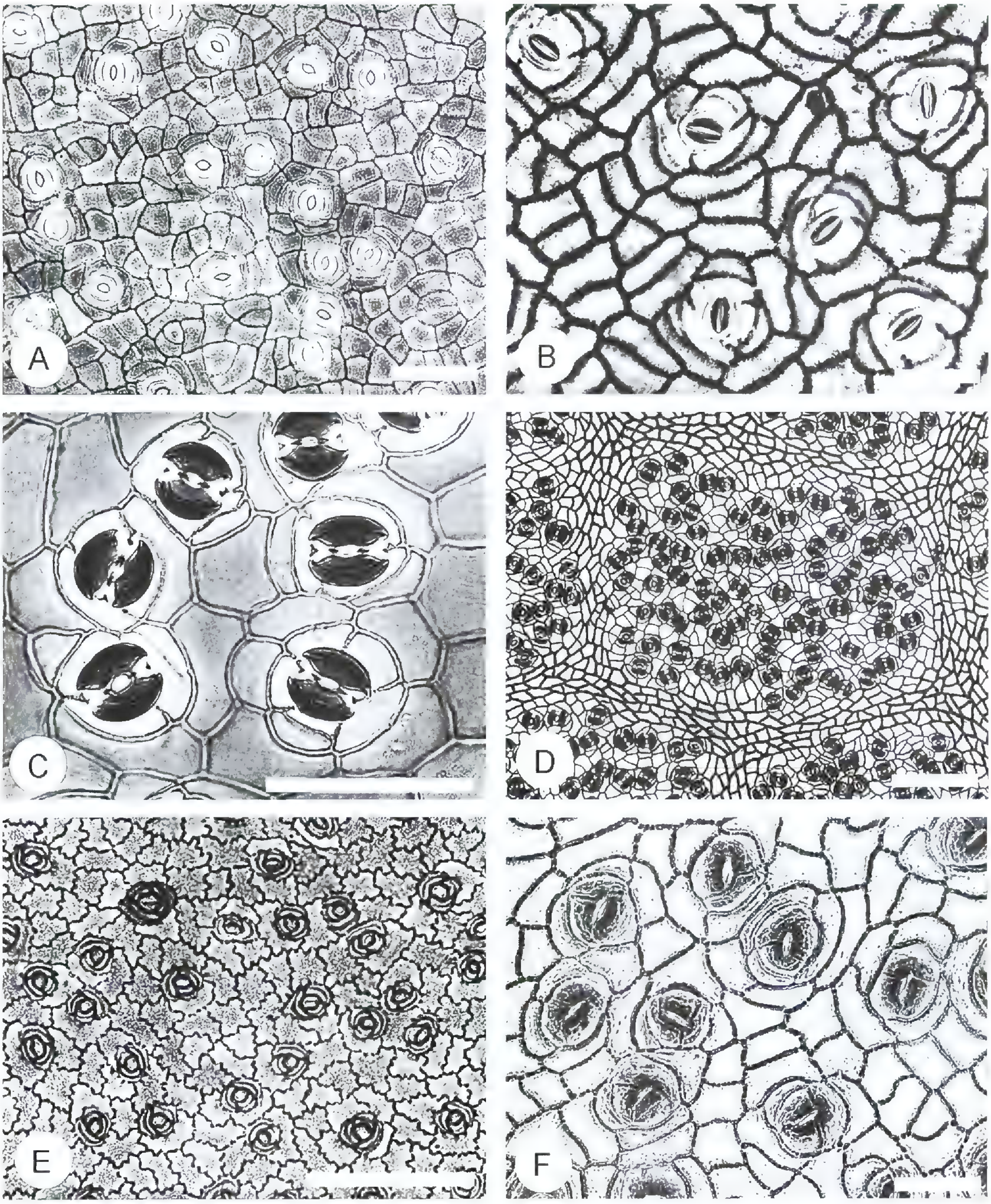

Figure 7. Abaxial leaf epidermis of *Wielandia*. —A. *W. bojeriana*. —B. *W. platyrachis*. —C. *W. laureola*. —D. *W. danguyana*, entire areole. —E. *W. fadenii*, with undulating anticlinal walls. —F. *W. ranavalonae*. A, *McWhirter & Capuron 178* (K); B, *Capuron 23555-SF* (P); C, *Decary 6569* (US); D, *Schlieben 8120* (G); E, *Randrianamera 89-RN* (P); F, *Capuron 20586-SF* (P). Scale bars = 50 µm.

the prominent appearance of the midvein in the dried leaves. In *Wielandia danguyana*, however, there is a continuous layer of sclerenchyma between the veins and the adaxial epidermis (Fig. 6I). This applies to all vein orders, with the exception of the free-ending veinlets, and results in the impressed midvein and the distinctive honeycombed appearance of the dried leaves of *W. danguyana* (Fig. 13A). The nearly perfect areolation in this species is also visible in the epidermis cells (Fig. 7D).

Finally, vascularization of the petiole is astonishingly diverse (Fig. 6A–H). This character was previously studied in the Euphorbiaceae s.l. by Dehay (1935), who did not, however, include any species of *Wielandia* in his survey. Three types can be distinguished: vascular bundle U-shaped in cross section

Table 3. Leaf anatomical characters of *Wielandia* 1: species with plicate cotyledons. *W. fadenii: Randrianamera 89-RN* (P), *Service Forestier 12398* (P); *W. bemarensis: Service Forestier 9383* (P); *W. mimosoides: Service Forestier 26166* (P), *Thouvenot 131* (US); *W. oblongifolia: Decary 6389* (P); *W. tanalorum: Decary 5104* (K).

	W. fadenii	*W. bemarensis*	*W. mimosoides*	*W. oblongifolia*	*W. tanalorum*
Epidermis, adaxial (µm)	15–20	13–20	15–20	25–40	17–20
Epidermis, abaxial (µm)	8–12	7–10	8–12	12–17	9–11
Anticlinal walls, adaxial (µm)	1–2	1–2	1	2–3	1–2
Anticlinal walls, abaxial (µm)	1–2	1	1	1–2	1
Periclinal walls, adaxial (µm)	4–5	5–8	5–6	6–8	5–6
Periclinal walls, abaxial (µm)	3–4	3–4	4–5	5	3–4
Stomata (µm)	17–22 × 20–25	20–25 × 18–22	20–23 × 22–25	22–25 × 22–25	16–18 × 18–20
Subsidiary cells	3(4)	3 to 5(6)	3(4)	3 to 5(6)	3 to 5(6)
Water stomata presence	+	–	–	+	–
Palisade layers	1 to 2	1 to 2	1 to 2	2	2
Ratio palisade : spongy layer	1 : 1–1.5	1 : 1.5–2	1 : 1.5–2	1 : 1.5–2	1 : 1–1.5

over the entire length of the petiole (*W. danguyana*, Fig. 6E; and *W. fadenii*, Fig. 6A); cylindrical over the entire length of the petiole (former *Blotia* species, *W. bojeriana*, Fig. 6B; *W. elegans*, and *W. ranavalonae*, Fig. 6F); or changing from basally U-shaped in cross section to distally cylindrical in cross section (*W. laureola*, Fig. 6G, H; and *W. platyrachis*, Fig. 6C, D). The cylindrical bundle is sometimes interrupted in *W. elegans* and *W. ranavalonae*, and in *W. laureola*, two additional small adaxial bundles merge with the main bundle in the middle of the petiole and contribute to the cylinder at the distal end.

Table 4. Leaf anatomical characters of *Wielandia* 2: species with thick cotyledons (unknown in *W. laureola*). *W. bojeriana: Capuron 28582-SF* (P), *McWhirter & Capuron 178* (K), *Phillipson 2919* (P); *W. danguyana: Capuron 11964-SF* (P), *Schlieben 8120* (G), *Service Forestier 2529* (P); *W. laureola: Decary 6569* (US); *W. platyrachis: Capuron 11793-SF* (P), *Capuron 23555-SF* (P), *Capuron 23828-SF* (P); *W. ranavalonae: Bosser 9070* (P), *Capuron 20586-SF* (P).

	W. bojeriana	*W. danguyana*	*W. laureola*	*W. platyrachis*	*W. ranavalonae*
Epidermis, adaxial (µm)	20–25	25–35	32–35	25–60	25–30
Epidermis, abaxial (µm)	17–20	13–18	17–20	20–40	20–25
Anticlinal walls, adaxial (µm)	2–3	3	2–3	2–3	3–4
Anticlinal walls, abaxial (µm)	1–3	1–2	1–2	2–4	2–3
Periclinal walls, adaxial (µm)	10–12	6–8	14–16	8–20	10–15
Periclinal walls, abaxial (µm)	7–10	5–6	10–12	8–25	10–15
Stomata (µm)	20–23 × 20–23	20–25 × 25–30	20–25 × 18–23	30–40 × 30–40	35–40 × 40–45
Subsidiary cells	3 to 4(5 to 6)	3 to 4(5 to 6)	3(4 to 5)	3(4)	3(4)
Water stomata presence	+	+	+	–	–
Palisade layers	2	1 to 2	2	2 to 4	2
Ratio palisade : spongy layer	1 : 3	1 : 2	1 : 2–3	1 : 2	1 : 3

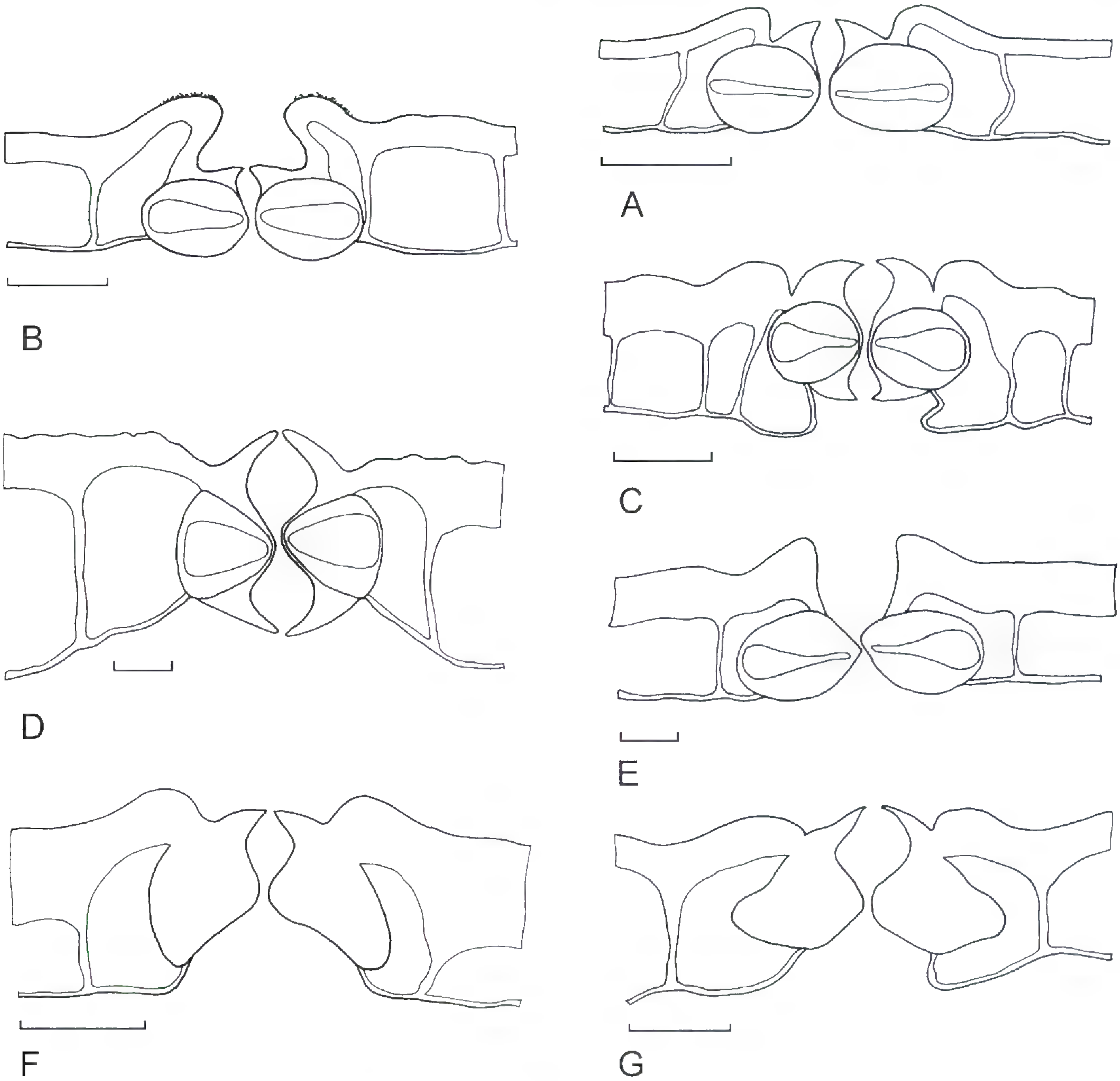

Figure 8. Stomatal apparatus of *Wielandia* in cross section. —A. *W. tanalorum*. —B. *W. fadenii*. —C. *W. bojeriana*. —D. *W. platyrachis*. —E. *W. ranavalonae*. —F. *W. laureola*. —G. *W. danguyana*. A, *Decary 5104* (K); B, *Randrianamera 89-RN* (P); C, *Capuron 28582-SF* (P); D, *Capuron 11793-SF* (P); E, *Capuron 20586-SF* (P); F, *Decary 6569* (US); G, *Schlieben 8120* (G). Scale bars = 10 μm. Drawn by Petra Hoffmann.

BIOGEOGRAPHY AND ECOLOGY

The genus *Wielandia* occurs mainly in Madagascar. Ten of the 13 species are endemic to the island, whereas *W. ranavalonae* also occurs in the Comoro Islands, *W. elegans* also occurs in the Comoro Islands and in the Seychelles, and *W. fadenii* is found in Madagascar, the Comoro Islands, and southeastern Kenya. The latter distribution pattern is also found in other Euphorbiaceae s.l. (A. Radcliffe-Smith, pers. comm.), e.g., in *Aristogeitonia* Prain (Picrodendraceae), which has four species in Madagascar, two in southeast Kenya and northeast Tanzania, and one in Angola (Radcliffe-Smith, 2001).

In Madagascar, the genus is most commonly found in eastern wet forest but also occurs in the subhumid and montane bioclimatic zones (Cornet, 1974). The only species found in the western dry and subarid zones are *Wielandia fadenii* (Fig. 12) and, to a lesser extent, *W. bemarensis* (Hoffmann & McPherson, 1998). The collecting localities of *W. bojeriana* (Fig. 10) and *W. ranavalonae* (Fig. 11) in the predominantly subarid southwest are situated in pockets of subhumid bioclimate with deciduous but not overly dry forest (Sakaraha, Zombitsy, and the Fiherenana Valley).

Ten species are widely distributed in Madagascar, whereas the remaining three have very small distribution areas. *Wielandia elegans* (Hoffmann, 1998) is scattered across the island. *Wielandia bojeriana* (Fig. 10), and *W. mimosoides* (Hoffmann & McPherson, 1998: fig. 4B) seem to occur evenly

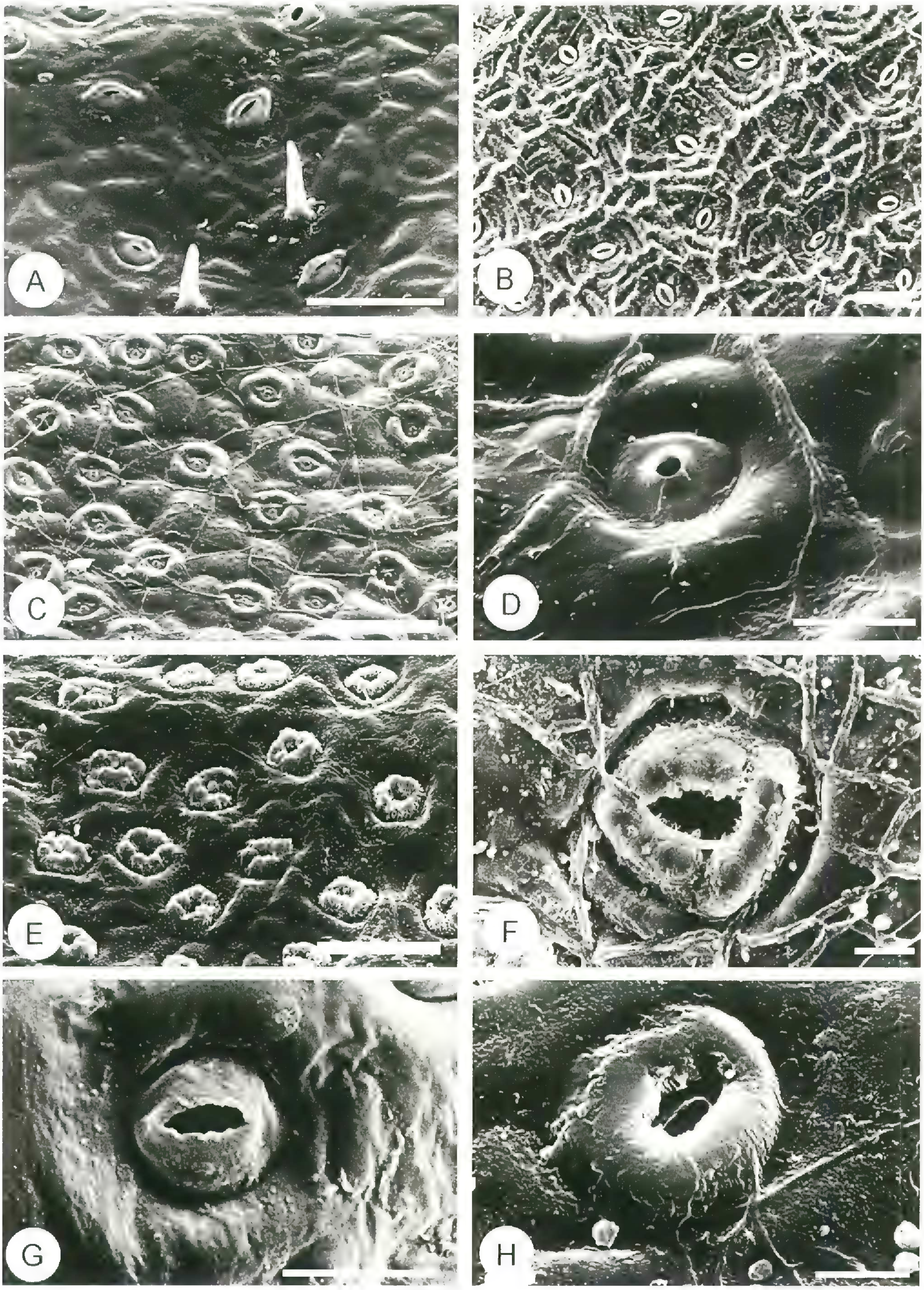

Figure 9. Abaxial leaf surface of *Wielandia*. —A. *W. bojeriana*, with trichomes. —B. *W. platyrachis*, with cuticular folds. —C. *W. laureola*. —D. *W. danguyana*. —E. *W. fadenii*, epicuticular wax concentrated around stomata. —F. *W. ranavalonae*. —G. *W. mimosoides*. —H. *W. oblongifolia*. A, *Phillipson 2919* (P); B, *Capuron 23555-SF* (P); C, *Decary 6569* (US); D, *Service Forestier 2529* (P); E, *Service Forestier 12398* (P); F, *Capuron 20586-SF* (P); G, *Service Forestier 26166* (P); H, *Decary 6389* (P). Scale bars = 50 μm in A–C, E; 10 μm in D, F–H.

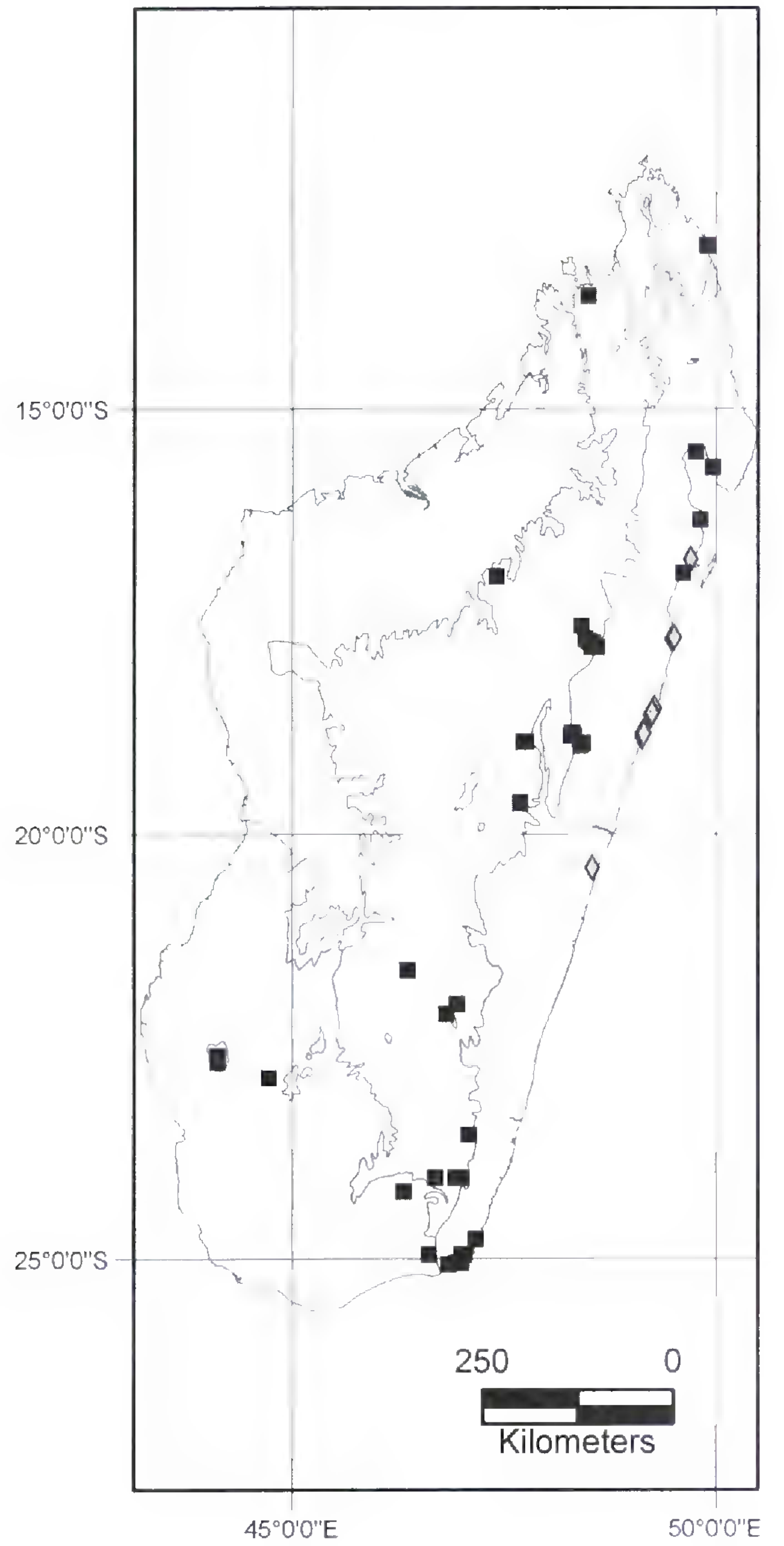

Figure 10. Distribution of *Wielandia bojeriana* (black squares) and *W. laureola* (gray diamonds with black outline).

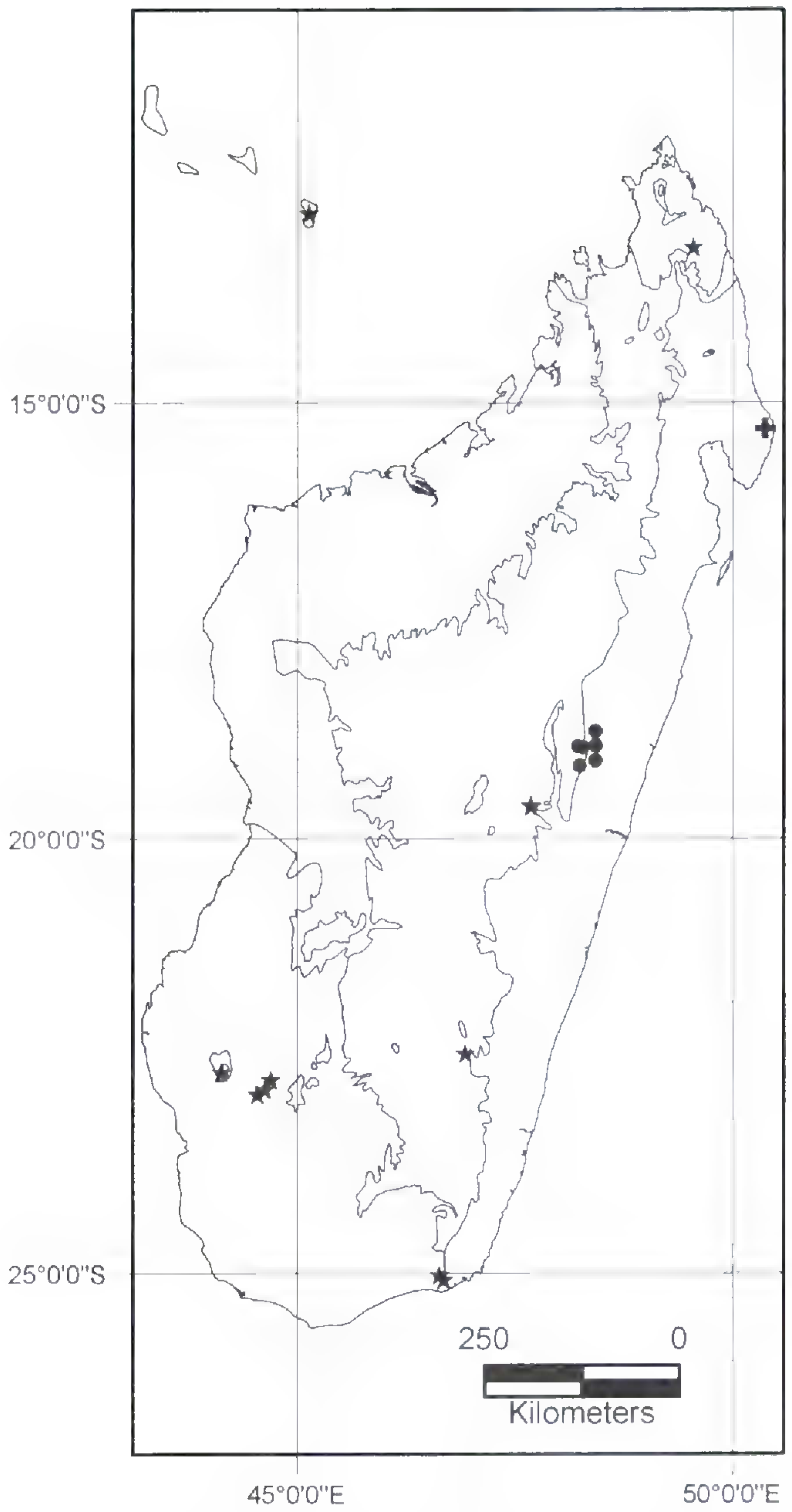

Figure 11. Distribution of *Wielandia danguyana* (black circles), *W. ranavalonae* (black stars), and *W. unifex* (black cross).

throughout the perhumid to subhumid and montane zone but have not been collected north of the Masoala Peninsula. Another widely distributed species, *W. platyrachis* (Fig. 12), is principally restricted to the perhumid zone along the east coast. The two distribution areas of *W. platyrachis* in the northwest represent pockets of humid forest, such as the Montagne d'Ambre. A similarly eastern, but less extensive distribution is shown by *W. leandriana* (Hoffmann & McPherson, 1998: fig. 4A). *Wielandia oblongifolia* and *W. tanalorum* (Hoffmann & McPherson, 1998: fig. 4C–D) extend from the humid zone to the transition between humid and subhumid zones. Information on the distribution of *W. ranavalonae* (Fig. 11) is sketchy due to the scarcity of collections, but the species seems to prefer deciduous forest in Madagascar, whereas in Mayotte it is recorded from humid forest.

Only two species prefer dry conditions. One is *Wielandia fadenii* (Fig. 12), which mainly occurs in the limestone karst areas (tsingy) of the west and the limestone massif of Ankarana in the north. An exception in Figure 12 is the morphologically divergent southernmost collection of *W. fadenii* from Farafangana on the humid east coast, which might represent a separate subspecies. The other species with a preference for dry habitats is *W. bemarensis* (Hoffmann & McPherson, 1998: fig. 4A), found mainly in the dry regions of northwestern Madagascar, with some specimens in the transition from the dry to the subhumid zone.

Wielandia danguyana and *W. laureola* are both narrow endemics inhabiting small areas in the eastern perhumid bioclimatic zone. *Wielandia danguyana* (Fig. 11) has

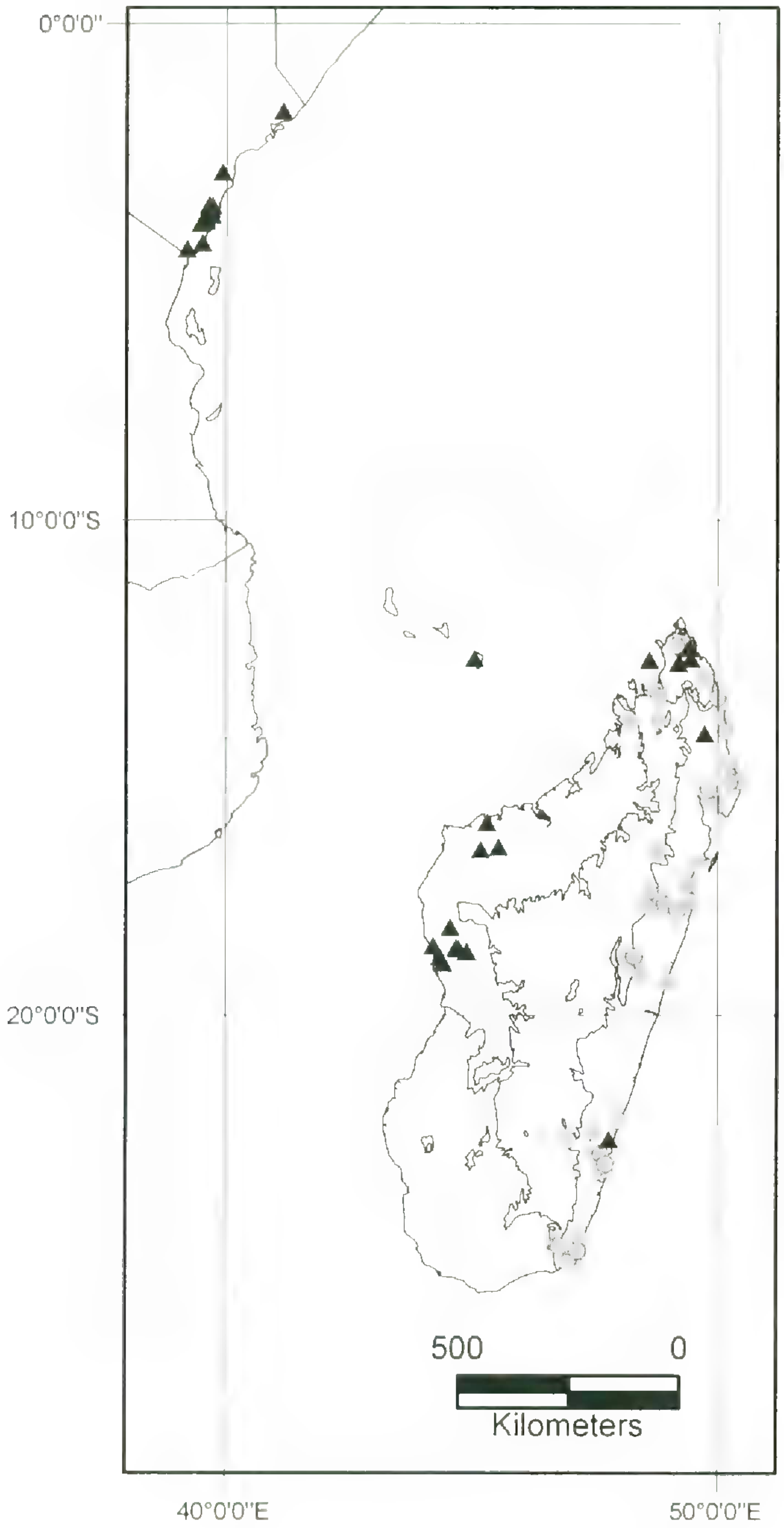

Figure 12. Distribution of *Wielandia fadenii* (black triangles) and *W. platyrachis* (gray circles).

been found only around Andasibe (Périnet), whereas *W. laureola* (Fig. 10) is restricted to the littoral white sand forest between Pointe à Larrée and Nosy-Varika. *Wielandia unifex* (Fig. 11) is only known from one collection from Antalaha in northeastern Madagascar.

Conservation

Most of Madagascar's primary vegetation has been destroyed since humans arrived on the island no more than 2000 years ago. It is estimated that only 19% of the primary native vegetation remains today, and this percentage is steadily decreasing (see www.vegmad.org). Continuing slash-and-burn agriculture (tavy), combined with land clearing for cattle grazing, pose the gravest danger for biodiversity in Madagascar. With this outlook, only species that thrive in disturbed habitats and secondary vegetation can be classified as Least Concern (LC) on the IUCN rating scale (IUCN, 2001). There is no evidence that this is the case for any species of *Wielandia*.

The 10 species *Wielandia bemarensis*, *W. bojeriana*, *W. elegans*, *W. fadenii*, *W. leandriana*, *W. mimosoides*, *W. oblongifolia*, *W. platyrachis*, *W. ranavalonae*, and *W. tanalorum* seem to be reasonably common within a distribution area that is large enough to support a genetically diverse population. All 10 are here assigned the category Near Threatened (NT) because of the threat to all natural habitats in Madagascar, despite serious efforts of the government to establish and maintain protected areas. *Wielandia fadenii* and *W. ranavalonae* also occur outside Madagascar, lessening concern for their survival despite the fact that they are ecologically more restricted and less frequently collected than the more common species.

There is, however, great concern for *Wielandia danguyana* and *W. laureola* because of their narrow distribution, and in the latter species, ecological preference for the fragile and unprotected white sand littoral forest. They are both here rated Endangered: EN B1ab(iii). *Wielandia unifex* is Data Deficient (DD), as it is only known from the type collection. For more details on the conservation status, see the individual species accounts.

Taxonomic Treatment

Wielandia Baill., Étude Euphorb.: 568, t. 22. 1858. *Savia* Willd. sect. *Wielandia* (Baill.) Müll. Arg., Linnaea 32: 78 (1863). TYPE: *Wielandia elegans* Baill., Étude Euphorb., Atlas: 40, t. 22, figs. 6–10. 1858.

Petalodiscus Baill., Étude Euphorb., Atlas: 40, t. 22. 1858, nom. altern. Syn. nov. *Savia* Willd. section *Petalodiscus* Baill., nom. altern., Étude Euphorb.: 571. 1858. *Andrachne* L. section *Petalodiscus* (Baill.) Kuntze in T. Post & Kuntze, Lex. Gen. Phan.: 28. 1903, [as "*Andrachna*"]. TYPE: *Petalodiscus platyrachis* Baill.

Blotia Leandri, Mém. Inst. Sci. Madagascar, Sér. B, Biol. Vég. 8: 240. 1957. Syn. nov. TYPE: *Blotia oblongifolia* (Baill.) Leandri [= *Savia oblongifolia* Baill.].

Monoecious trees or shrubs without or with weakly developed, simple indumentum; young branches sometimes flattened. *Stipules* caducous or persistent, sometimes peltate; *petioles* adaxially ± distinctly channeled or terete; vascular bundles U-shaped in cross section or cylindrical throughout, or basally U-shaped and cylindrical from the middle; *leaves* alternate, simple, eglandular; leaf blades symmetrical, entire, pinnately veined, ovate, elliptic, oblong, nearly orbicular or rarely obovate, apically acuminate to retuse, basally truncate to acute, sometimes auriculate; anticlinal walls of leaf epidermis straight (undulating in *W. fadenii*); stomata cyclocytic with 3 to 6 subsidiary cells. *Inflorescences* axillary or cauline; flowers directly in the leaf axils, or on unbranched or branched, usually leafless axes; staminate and pistillate flowers in the same or in separate fascicles. *Flowers* 1–10 × 1–10 mm; *pedicels* 1–30 mm long, inarticulate; *sepals* (4 or)5(or 6), quincuncial in 5-merous flowers; *petals* (4 or)5(or 6), half as long to 3× as long as sepals; *disc* extrastaminal, glabrous or rarely pubescent, of discrete alternipetalous lobes, or alternipetalously deeply lobed or crenate, or annular, or lacerated; as long as or much shorter than the sepals, sometimes of different structure in staminate and pistillate flowers; *stamens* alternipetalous; filaments free or partly fused; anthers introrse, dehiscing longitudinally, pistillode 3-fid (5-fid in *W. elegans*); *ovary* 3(to 5)-locular, locules biovulate; styles 3 (rarely 4 or 5), free, 2-fid to the base; stigmas acute to slightly capitate. *Fruits* solitary schizocarps, subglobose to globose, 3(to 5)-lobed; dehiscence septicidal, loculicidal, and septifragal; dehiscence of septae irregular; fruiting pedicels 3–50 mm long; columella 5–10× longer than the narrowest width, acutely 3(to 5)-angled, base and apex ± thickened; disc and perianth usually persistent in the fruiting stage; *seeds* 1 or 2 per locule, ecarunculate, usually apiculate and with ± distinct perichalazal annulus, globose, ovoid or ellipsoid (1-seeded locules) or nearly triangular in cross section (2-seeded locules); endosperm in mature seeds absent but for a thin membrane; embryo either with hemispherical to hemi-ovoid cotyledons and the radicle hardly longer than wide or with thin and folded cotyledons and the radicle ca. 3× as long as wide.

The genus contains 13 species; it is distributed in Madagascar, the Seychelles, Comoro Islands, and southeastern Kenya.

A complete list of specimens studied for each species is available via the Tropicos website (http://mobot.mobot.org/W3T/Search/vast.html) by searching for the species name and then clicking on "Specimen lists and maps." By clicking on any specimen in the resulting list, one can confirm that it was determined by us.

KEY TO THE SPECIES OF *WIELANDIA*

1. Midvein adaxially distinctly impressed; other venation conspicuously reticulate when dry, lacking distinct secondary veins (Fig. 5A) . . . . 3. *W. danguyana*
1′. Midvein adaxially ± prominent; other venation not conspicuously reticulate when dry, secondary veins differentiated . . 2
2. Higher leaf venation very finely areolate, resembling graph paper, most areoles less than 0.2 mm in diameter (Fig. 5G); stipules persistent, at least 2 mm long; young twigs terete, often pubescent or puberulent; cotyledons (where known) thin, folded several times (former *Blotia* species plus *W. unifex*) 3
2′. Higher leaf venation with medium-sized to large areoles, not resembling graph paper, most areoles more than 0.2 mm in diameter; stipules caducous, or persistent and no longer than 2 mm; young twigs flattened or terete, glabrous (except in *W. bojeriana*, which has maroon petals, elongate styles, and both axillary and cauline inflorescences); cotyledons hemispherical to hemi-ovoid, or folded 8
3. Sepals thickened and usually pubescent at tips; leaf blades (2.5–)4–9 cm long; petioles not channeled adaxially; flowers 3–6 mm long . . . . 12. *W. tanalorum*
3′. Sepals undifferentiated apically, glabrous; leaves and petioles various; flowers 1.5–3 mm long 4
4. Petioles 3–10 mm long; twigs glabrous 5
4′. Petioles 1–3 mm long; twigs often pubescent 6
5. Petioles adaxially channeled, 1–1.5 mm wide; fruits 10–13 mm long . . . . 9. *W. oblongifolia*
5′. Petioles terete, 0.5–0.8 mm wide; fruits ca. 9 mm long . . . . 13. *W. unifex*
6. Petals (1.5–)2–3 mm long, usually longer than the sepals at anthesis, clawed only at the base; leaf blades auriculate, ovate to elliptic; western and northern Madagascar . . . . 1. *W. bemarensis*
6′. Petals 1–1.5 mm long, as long as or shorter than the sepals at anthesis, clawed for about half the length; leaf blades auriculate or not, elliptic; eastern and central Madagascar 7
7. Leaf blades auriculate, 1.5–3(–4) cm long; pedicels less than 15 mm long; petals 1 mm long . . . . 8. *W. mimosoides*
7′. Leaf blades not or scarcely auriculate, 2–6(–8) cm long; pedicels 10–20 mm long; petals 1–1.5 mm long . . . . 7. *W. leandriana*
8. Leaf blades long-acuminate, the tip 10–20 mm long, the sides subparallel for over half their length 9
8′. Leaf blades not or only short-acuminate, the acuminate portion very rarely over 10 mm long and then not parallel-sided 10
9. Petiole channeled; petals 1.5–2 mm long, about twice as long as the sepals (except for one specimen from SE Madagascar; see note); disc pubescent . . . . 5. *W. fadenii*
9′. Petiole terete; petals ca. 1 mm long, shorter than the sepals; disc glabrous . . . . 13. *W. unifex*
10. Base of petals thickened (Fig. 11L–N); young twigs and inflorescence axis always flattened or 2-winged . . . . 10. *W. platyrachis*

10′. Base of petals not thickened; young twigs terete or flattened 11
11. Ovary and fruit (4–)5(–6)-locular; pistillode 5-lobed; flowers 4–10 × 5–10 mm; perianth parts not reflexed . . . . 4. *W. elegans*
11′. Ovary and fruit 3-locular; pistillode 3-lobed; flowers 1–10 × 2–8 mm; perianth parts reflexed or not 12
12. Flowers 1–2 mm long, borne on ± leafless axes; leaves acute to acuminate, discolorous, with inconspicous marginal ultimate venation . . . . 6. *W. laureola*
12′. Flowers 3–10 mm long, borne directly in the axils of regular leaves; leaves acute (very rarely acuminate) to retuse, concolorous, with usually conspicuously exmedial and parallel marginal ultimate venation (Fig. 4A–C) 13
13. Leaves ovate to nearly orbicular, acute (very rarely acuminate) to rounded; stylar branches terete, about 10× as long as wide, stigmas truncate; filaments free, ca. 0.5 mm thick, connective deltoid; columella of fruit ca. 7 mm long, up to 2 mm wide at apex; sepals of mature flowers usually reflexed; disc membranous, irregularly crenulate to deeply lacerate . . . . 2. *W. bojeriana*
13′. Leaves obovate to nearly orbicular, retuse to rounded; stylar branches tapering, about as long as wide, stigmas acute; filaments fused for half of their length, ca. 0.2 mm thick, thecae parallel; columella of fruit 8–12 mm long, 2–3 mm wide at apex, clavate; sepals of mature flowers erect; disc fleshy, 5-lobed . . . . 11. *W. ranavalonae*

1. **Wielandia bemarensis** (Leandri) Petra Hoffm. & McPherson, comb. nov. Basionym: *Savia bemarensis* Leandri, Bull. Soc. Bot. France 81: 588. 1934. *Blotia bemarensis* (Leandri) Leandri, Mém. Inst. Sci. Madagascar, Sér. B, Biol. Vég. 8: 242. 1957. Syn. nov. TYPE: Madagascar. Tsingy du Bemaraha (9^e Réserve), Ambohivazimba, 150–200 m, *J. Leandri 938* (holotype, P!).

Blotia ankaranae Leandri, Mém. Inst. Sci. Madagascar, Sér. B, Biol. Vég. 8: 242. 1957. TYPE: Madagascar. Ankara de Diego-Suarez, *Service des Eaux et Forêts 9383* (holotype, P!).

Blotia ankaranae Leandri var. *sambiranensis* Leandri, Mém. Inst. Sci. Madagascar, Sér. B, Biol. Vég. 8: 243. 1957. TYPE: Madagascar. Bassin supérieur du Sambirano, 1700 m, *H. Humbert 18642* (lectotype, designated by Hoffmann & McPherson, 1998: 250, P!; duplicates, K!, P!).

IUCN Red List category. *Wielandia bemarensis* is widely distributed throughout the northwestern parts of Madagascar (Hoffmann & McPherson, 1998; fig. 4A). As with all species in Madagascar that occur predominantly in primary vegetation, there is cause for concern for its long-term survival, and it is rated NT (Near Threatened) by IUCN Red List criteria (2001).

For description, a complete list of specimens studied, and a distribution map see Hoffmann and McPherson (1998).

Selected specimens examined. MADAGASCAR. **Antsiranana prov.:** Diego-Suarez, Ankara, *Service Forestier 9383* (MO, P). **Mahajanga prov.:** Boina region, ca. 15 km NW of the village of Villanandro, RNI Namoroka, *DuPuy, DuPuy & Raharilala MB372* (K).

2. **Wielandia bojeriana** (Baill.) Petra Hoffm. & McPherson, comb. nov. Basionym: *Savia bojeriana* Baill., Adansonia 8: 345. 1868. TYPE: Madagascar. s. loc., *W. Bojer s.n.* (holotype, P!). Figures 1I–K; 3D–F; 4C; 6B; 7A; 8C; 9A.

Savia revoluta Scott-Elliot, J. Linn. Soc., Bot. 29: 48. 1891. Syn. nov. TYPE: Madagascar. Fort Dauphin, May, *G. F. Scott-Elliot 2558* (lectotype, designated here, K!; duplicates, BM!, E not seen, K!).

Savia bojeriana Baill. var. *perrieri* Leandri, Notul. Syst. (Paris) 7: 189. 1939. Syn. nov. TYPE: Madagascar. Forêt d'Analamazaotra, 800 m, *H. Perrier de la Bâthie 4647* (lectotype, designated here, P!; duplicate, P!).

Shrub, 2–7.5 m high; branches terete, striate, with lenticels, puberulent when young, glabrescent when older, rarely glabrous from the beginning. *Stipules* deltoid, acute, 1–2 × 0.5–1 mm, puberulent abaxially on apex and margins, caducous; *petioles* 1–3(–6) × 0.8–1.5(–2) mm, adaxially channeled to terete, puberulent or glabrous; petiolar vascular bundles cylindrical in cross section; *leaf blades* ovate, more rarely oblong, elliptic or nearly orbicular, apically acute to rounded, never with a dark point or mucro, basally acute to rounded, not to slightly revolute, with exmedial ultimate marginal venation, (1–)2–6(–16) × (0.5–)1–3(–6.5) cm, glabrous, rarely adaxially puberulent along the midvein (especially basally), coriaceous to chartaceous, green to yellowish green on both sides, dull to shiny, abaxially frequently slightly lighter, venation adaxially slightly (rarely more strongly) prominent, abaxially prominent; anticlinal walls of leaf epidermis straight; stomata with 3 to 4(to 6) subsidiary cells. *Inflorescences* axillary and cauline on the same individual. *Staminate flowers* (2–)5–10 × (2–)4–7 mm, often with green sepals, white (in young flowers) to maroon (in old flowers) petals and filaments, and yellow anthers fresh or dry, delicate, solitary or in 2- to 6-flowered fascicles; bracts deltoid, acute, keeled, up to 1 × 0.5 mm, abaxially puberulent; buds pedicellate, globose; *pedicels* 5–15 × 0.2–0.3 mm, terete, puberulent or glabrous; *sepals* 5, reflexed, oblong, rounded, 2–3 × 1.5–2 mm, ± fimbriate, glabrous or abaxially puberulent; *petals* 5, reflexed, rhombic, lanceolate or linear, acute or long-acuminate, (2–)3–5 × 1–3 mm, distinctly longer than the sepals, erose, glabrous, maroon; *disc* annular, irregularly crenulate to lacerate, sometimes lacerate to the base, to 0.5 mm long, glabrous; *stamens* 5, (1–)3–4 mm long; filaments free, flattened to terete, (1–)2.5–3.5 × ca. 0.5 mm; anthers broadly ovoid, 0.2–0.5 mm long, glabrous, connective deltoid, basally up to 0.5 mm wide, thecae at an angle of 45°–90°; pistillode terete, ca. 1 × 0.3 mm, 3-fid for half or all of its length; the parts terete, distally pubescent or glabrous. *Pistillate flowers* with green sepals and ovaries, white (in young flowers) to maroon (in old flowers) petals (fresh or dry), axillary, solitary, rarely in twos, 4–5 × 4–8 mm, robust; bracts deltoid, acute, keeled, 1–2 × ca. 1 mm, abaxially puberulent; buds pedicellate, ellipsoid; *pedicels* 8–25 × 0.5–0.7 mm, terete to flattened, distally slightly thickened, puberulent or glabrous; *sepals* 5, usually reflexed, lanceolate to linear, acute, 2–5 × 2–3 mm, with ± membranous, fimbriate margins, otherwise glabrous, thick, usually with conspicuously prominent veins, light brown when dry; *petals* as in staminate flowers, but only reflexed as far as the thick sepals allow, caducous; *disc* as in staminate flowers, but ca. 1 mm long; *ovary* 3-locular, cylindrical to globose, ca. 1 mm long, glabrous; *styles* 3, 2-fid to the base; stylar branches terete, 2–3 × 0.2–0.3 mm, straight or basally ascending, then appearing eccentric with sometimes a conical structure between the styles, glabrous; stigmas obtuse to truncate. *Fruits* solitary, subglobose to globose, 3-lobed, 8–10 × 12–13 mm, glabrous, smooth, not reticulate, distinctly wrinkled when dry, yellow to light yellowish brown; fruiting pedicels 10–20 × 0.5–0.7 mm, terete, puberulent or glabrous; columella ca. 7 × 1 mm, basally abruptly thickened to 1.5 mm, distally hardly thickened or to 2 mm wide, disc and sepals persistent; exocarp ca. 0.5 mm thick, 3-layered; the middle layer fibrous (probably fleshy when fresh); endocarp ca. 0.3 mm thick; *seeds* 1 or 2 per locule, apiculate, with ± distinct perichalazal annulus, globose to ovoid (1-seeded locules) or nearly triangular in cross section (2-seeded locules), 5–9 × 5–6 mm, smooth, dull, ± marbled, greyish brown; embryo conical with hemi-ovoid cotyledons; radicle terminal, hardly longer than wide.

Illustrations: Leandri in Humbert, Fl. Madagascar 111(1): 123, figs. 20.6–8. 1958 (habit, fruits).

A Kew sheet (*Bojer s.n.* and s. loc.) of *Wielandia bojeriana* is a possible isotype.

In the protologue of *Savia revoluta* (Scott-Elliot, 1891) the syntypes *Scott-Elliott 2538* and *2845* are cited. These numbers are not present in BM, E, and K, and only number *2845* exists in P. The numbers *2558* (BM, E, K) and *2848* (K), however, are marked "Typus!" by N. E. Brown, who is acknowledged by Scott-Elliott (1891) for his help. This suggests that the latter are the correct types, and that the confusion is due to a typographic error. We choose number *2558* as lectotype, because duplicates exist in three different herbaria.

Both the type of *Savia bojeriana* var. *perrieri* and the specimen *Boiteau 132* have the bullate leaves said to distinguish var. *perrieri* from the typical variety (Leandri, 1939), but they are otherwise morphologically unremarkable in *Wielandia bojeriana*. Bullate leaves are also found on rare occasions in *W. oblongifolia*.

Wielandia bojeriana is a morphologically variable species, especially in leaf shape, size, and texture. The two specimens *Schatz et al. 1844* (P) and *Schatz & Gentry 2080* (P), although perfectly matching other specimens of *W. bojeriana* in their flower characters, are vegetatively different in having acuminate leaves and being completely glabrous. In view of the considerable variability of this species, we have refrained from describing a new taxon exclusively based on foliar characters in two specimens.

Distribution and ecology. Madagascar, central to western limit of eastern floral domain, rarely in southwestern domain. Shady coastal forest, dry forest and scrub; on sand over granite and basalt; 0–1600 m altitude. Can be very common in wet forest (observed in Ivohibe). Figure 10.

IUCN Red List category. *Wielandia bojeriana* is relatively frequent in healthy forests and is protected in several nature reserves. However, as the remaining primary vegetation is disappearing fast in Madagascar, we recommend that it be rated, by IUCN (2001) criteria, NT (Near Threatened); 47 specimens were studied.

Etymology. The species epithet refers to the collector of the type specimen, W. Bojer (1797–1856).

Vernacular names. Hazomainty (*Boiteau 2507*), Zaimboalavo (or Zaunboalavo?) (*Rakotoniaina 10722-RN*, *11712-RN*).

Representative specimens examined. MADAGASCAR. **Antsiranana prov.:** vallée de la Beandrona, à l'Est d'Ambanja, *Capuron 18930-SF* (K, P). **Toamasina prov.:** Forêt de Sahavolamena, au Sud de Soanierana-Ivongo, *Capuron 28116-SF* (P); Nosy Mangabe, *Schatz et al. 1844* (MO, P); Forêt près de Périnet, *Boiteau 132* (K, MO, P); Tsinjoarivo, 45 km à l'Est d'Ambatolampy, *Capuron 18510-SF* (K, MO, P); Ilot boisé du sommet de la montagne appelée Analavorikely, *Cours 2138* (MO, P); Distr. Ambatondrazaka, Lac Alaotra, Menaloha, *Cours 636* (= TAN 4119 = MEN 20) (P). **Fianarantsoa prov.:** Ambalavao, Sendrisoa, *Bosser 1195* (P); Réserve Spéciale de Pic d'Ivohibe, Forest of Marovitsika, *Hoffmann et al. 238* (DAV, G, K, MO, P, TAN). **Toliara prov.:** Forêt d'Analavelona (Bassin du Fiherenana), *Humbert 19759* (K, MO, P); vallée moyenne du Mandrare près d'Anadabolava, *Humbert 12501* (P); préfecture de Tolanaro (Ft. Dauphin), Petriky, *Rabevohitra et al. 1816*

(K, MO, P); Toliara, prefecture de Tolanaro (Fort Dauphin), Mandena, *Rabevohitra 2130* (K, MO, P); Forêt du Vinanibe, près de Ft. Dauphin, *Capuron 22291-SF* (MO, P); Versant sud et plateau sommital du massif granitique du Vohitrandriana (au S de Ranopiso), *Capuron 28582-SF* (MO, P).

3. **Wielandia danguyana** (Leandri) Petra Hoffm. & McPherson, comb. nov. Basionym: *Savia danguyana* Leandri, Mém. Inst. Sci. Madagascar, Sér. B, Biol. Vég. 8: 239. 1957. TYPE: Madagascar. Antsakatsaka, entre Beravina et Périnet, 14 Dec. 1951, *Service des Eaux et Forêts 5728* (lectotype, designated here, P!; duplicates, K!, MO!). Figures 1D–F; 5A, B; 6E, I; 7D; 8G; 9D; 13.

Blotia oblongifolia (Baill.) Leandri var. *louvelii* Leandri, Notul. Syst. (Paris) 7: 190. 1939 [as "louveli"]. Syn. nov. TYPE: Madagascar. Analamazaotra, 1925, *M. Louvel 77* (holotype, P!).

Small tree, 3–8 m high; indumentum absent; branches terete, striate. *Stipules* very early caducous; stipule scars visible even on youngest leaves; *petioles* 4–10 × 0.8–1.2 mm, adaxially slightly channeled; petiolar vascular bundles in cross section U-shaped with inflexed sides; *leaf blades* ovate, apically acuminate, apiculum rounded, basally acute to obtuse, 3–8 × 1.5–4.5 cm, coriaceous, yellowish green, slightly shiny, midvein adaxially strongly impressed, abaxially prominent, remaining venation prominent on both sides, conspicuously reticulate, distinct secondary veins absent; anticlinal walls of leaf epidermis straight; stomata with 3 to 4(to 6) subsidiary cells. *Inflorescences* axillary; either 3–5 cm long, unbranched, leafless, with fascicles of 2 to 5 staminate and pistillate flowers, a total of 25 to 40 flowers per inflorescence; or flowers in fascicles of 5 to 25 flowers in the axil of leaf-like bracts, appearing cauline on older branches after abscission of bracts. *Staminate flowers* up to 2 × ca. 2 mm, delicate; bracts deltoid, acute, ca. 0.5 × 0.5 mm; buds pedicellate, globose, completely encased by the sepals, petals strongly folded; *pedicels* 6–17 × 0.3–0.5 mm, terete, distally not thickened; *sepals* 5, deltoid, acute, ca. 1 × 0.5 mm; *petals* 5, spathulate, rounded, apically usually bent inward, clawed, ca. 1.5 × 0.5 mm; *disc* deeply alternipetalously lobed; lobes 5, 2-fid, erose or truncate, ca. 1 × 0.5 mm, hard; *stamens* 5; ca. 0.8 mm long; filaments free, terete, ca. 0.5 mm long; anthers ovoid, 0.3–0.5 mm long; pistillode terete, clavate, 3-lobed, ca. 0.8 × 0.5 mm. *Pistillate flowers* 2–3 × 1–2 mm, robust; bracts as in staminate flowers; buds pedicellate, ellipsoid, not encased by the sepals but by the thick petals; *pedicels* 4–10 × 0.5–0.7 mm, terete, distally thickened; *sepals* 5, deltoid, acute, ca. 1 × 1 mm, basally thick, margin membranous; *petals* 5, narrowly spathulate to rhombic, rounded to acute, 1.5–2 × ca. 0.5 mm, twice as long as sepals, thick; *disc* deeply alternipetalously lobed; lobes 5, emarginate, truncate or rounded, 0.5–0.8 × 0.2–0.5 mm; *ovary* 3-locular, globose, ca. 1 mm long; styles 3, 2-fid to the base; stylar branches terete, ca. 0.2 mm long, less than 0.1 mm thick, recurved; stigmas truncate; fruiting pedicels 8–15 × 0.7–1 mm, terete; calyx and disc usually persistent; columella 6–7 × 1 mm, basally hardly thickened, distally thickened to 1.5 mm. Only fragments of one *fruit* known, estimated diameter 8–9 mm, endocarp ca. 0.3 mm thick; *seeds* probably one per locule (only a single seed known), almost lens-shaped, 8 × 8 × 4 mm, smooth, shiny, dark brown; embryo lens-shaped with hemispherical cotyledons; radicle terminal, hardly longer than wide.

Illustrations: Leandri, Mém. Inst. Sci. Madagascar, Sér. B, Biol. Vég. 8: 241, figs. 7.1–7. 1957 (habit, flower), in Humbert, Fl. Madagascar 111(1): 127, figs. 21.1–7. 1958 (habit, flower; a more elaborate version of the same drawings); Levin, Ann. Missouri Bot. Gard. 73: 44, figs. 16, 17. 1986 (leaf venation); Muller et al., Trop. Subtrop. Pflanzenwelt 67: 63, figs. 1–6. 1989 (pollen).

The Paris sheet of *Service des Eaux et Forêts 5728* is designated as lectotype because Leandri was staff at the Paris herbarium.

Leandri (1958) must have described *Blotia oblongifolia* var. *louvelii* by mistake. He cited all three specimens listed for this variety (*Louvel 77*, *Gouvernement de Madagascar 9*, *Service de Colonisation 59*) on page 120 of the same volume under the morphologically distinctive species *Savia danguyana*, which they match perfectly.

Distribution and ecology. Eastern Madagascar, along Route Nationale No. 2 between Moramanga and Andasibe (Périnet). Forest. Figure 11.

IUCN Red List category. *Wielandia danguyana* is probably the most highly endangered species in the genus. No more than 11 specimens seem to have been collected, and the most recent collection was made in 1969. To judge from the herbarium specimens, the plants seem to flower profusely but to set fruit rarely. The species is restricted to a small area along a 16-km stretch of the road linking the capital Antananarivo with Toamasina (Tamatave), the largest port city of Madagascar. The land in this area is today intensely cultivated and virtually devoid of primary vegetation. The survival of this distinctive species depends entirely on the small nature reserve of Andasibe (Périnet) (ca. 8 km^2), and possibly the Parc National de Mantadia (ca. 102 km^2) close by. Both areas

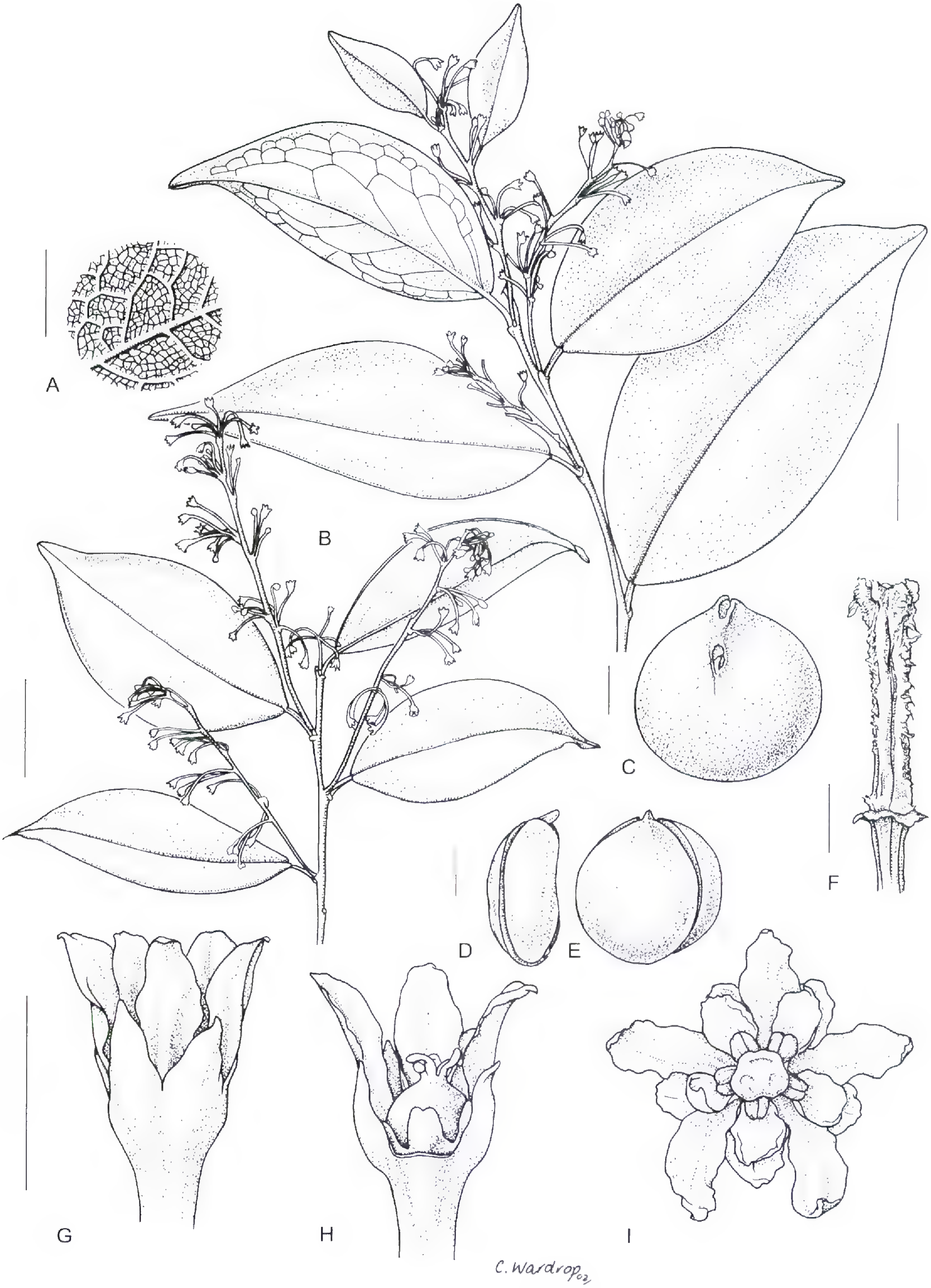

Figure 13. *Wielandia danguyana.* —A. Detail of leaf venation, abaxial surface. —B. Flowering branches. —C. Seed, ventral view. —D. Embryo, lateral view. —E. Embryo, ventral view. —F. Columella, persistent after fruit dehiscence. —G. Pistillate flower. —H. Pistillate flower, sepals and petals partly removed. —I. Staminate flower. A, B, G–I, *Ramaroson 5728-SF* (K); C–F, *Jarson Paul 14988-SF* (K). Scale bars = 5 mm in A; 20 mm in B; 2 mm in C–I. Drawn by Catherine Wardrop.

are accessible for recreation and ecotourism, and under particular pressure because of their proximity to the capital Antananarivo. The plant was not found during a recent visit of the park by the first author.

Due to the lack of recent collections, locality data are vague and many only indicate the greater area of Moramanga, which is the district capital. The plant is known from only three precise localities: Analamazaotra, Périnet, and Antsakatsaka, the first two being but 5 km apart, and used as two different names for the same forest. The extent of occurrence that can be calculated from these data is a maximum of 250 km^2 (generously assuming that it was actually collected near the city of Moramanga, and assuming a 10-km width of the possible distribution area along the road). For these reasons, the species is here rated Endangered: EN B1ab(iii). The IUCN (2001) rating is very close to Critically Endangered because the area of occupancy for the three safely located collections could be calculated as only 7.68 km^2. However, there is a possibility that the collections with vague localities were made in different locations within the extent of occurrence indicated above.

Etymology. The epithet honors the French botanist P. A. Danguy (1862–1942).

Vernacular names. Fanjavala (Leandri 1958: 121; *d'Alleizette s.n., Gouvernement de Madagascar 9, Louvel 77, Service de Colonisation 59, SF 2529, SF 5728, SF 14988, SF 26834*).

Representative specimens examined. MADAGASCAR. **Toamasina prov.:** Périnet-Analamazaotra, *Capuron 11964-SF* (K, MO, P); PK 27–28 route Moramanga–Anosibenala, *SF 26834* (MO, P).

4. Wielandia elegans Baill., Étude Euphorb., Atlas: 40, t. 22. 1858. *Savia elegans* (Baill.) Müll. Arg., Linnaea 32: 78. 1863. TYPE: [Seychelles.] Île Carenga, "communiqué par Boivin," 12 Nov. 1841, *A. Pervillé 971* (holotype, P!).

Wielandia elegans Baill. var. *perrieri* Leandri, Notul. Syst. (Paris) 7: 190. 1939. TYPE: Madagascar. Domaine de l'Ouest, Anbongo, Manongarivo, bois sablonneux, Jan. 1904, *H. Perrier de la Bâthie 1683* (lectotype, designated by Hoffmann, 1998: 335, P!; duplicate, P!).

IUCN Red List category. *Wielandia elegans* is distributed more or less evenly throughout Madagascar and also occurs in Comoro Islands (Mayotte) and the Seychelles (Hoffmann, 1998: fig. 2). Despite this wide distribution, it is not common and is reported to be in decline in some areas (Matyot, 2005). Considering the general threat to primary vegetation in the region, we propose the IUCN (2001) rating NT (Near Threatened) for this species.

For description, list of specimens studied, and distribution map see Hoffmann (1998).

5. Wielandia fadenii (Radcl.-Sm.) Petra Hoffm. & McPherson, comb. nov. Basionym: *Savia fadenii* Radcl.-Sm., Kew Bull. 27: 508. 1972. *Petalodiscus fadenii* (Radcl.-Sm.) Radcl.-Sm., Kew Bull. 47: 679. 1992. TYPE: Kenya. Kilifi District, Chasimba, ca. 13 km NE of Kaloleni, Kaloleni–Kilifi rd., 03°43′S, 39°42′E, 200 m, *R. B. Faden, A. Evans & M. Githui 71/263* (holotype, K!; isotype, EA not seen). Figures 1G, H; 2D–F; 3G, H; 5C, D; 6A; 7E; 8B; 9E.

Tree or shrub, 1.5–15 m high, trunk sometimes fluted or gnarled; indumentum absent except for floral disc; bark smooth; branches terete, ± striate. *Stipules* very early caducous (bracts can easily be mistaken for stipules), ovate, obtuse to rounded, auriculate, ca. 1.5 × 1 mm; *petioles* 3–5 × 0.5–1 mm, adaxially channeled; petiolar vascular bundles in cross section shallowly U-shaped; *leaf blades* ovate, apically long-acuminate, apiculum rounded, basally obtuse to truncate, rarely acute, often slightly decurrent, (2.5–)4–8 × (1–)2–4 cm, chartaceous to coriaceous, yellowish green to olive-green, adaxially moderately shiny, abaxially dull to slightly shiny, midvein adaxially hardly prominent, abaxially prominent, remaining venation prominent on both sides; anticlinal walls of leaf epidermis undulating; stomata with 3(or 4) subsidiary cells. *Inflorescences* axillary, 1–2 cm long, unbranched, leafless (rarely some strongly reduced bracts present); 1(2) pistillate and 2 to 4 staminate flowers per fascicle; 15 to 25 flowers per inflorescence. *Staminate flowers* ca. 2 × 2–4 mm, delicate; bracts deltoid, acute, erose to fimbriate, ca. 0.5 × 0.5 mm; buds pedicellate, globose; *pedicels* 7–15 × 0.1–0.2 mm, terete, distally not thickened; *sepals* 5, narrowly deltoid to lanceolate, acute to obtuse, undulate, slightly erose, ca. 1 × 0.5 mm; *petals* 5, lanceolate, acute, undulate, strongly erose, clawed, 1.5–2 × 0.5–1 mm, about twice as long as sepals; *disc* deeply lobed; disc lobes 5, alternipetalous, emarginate, truncate or rounded, 0.5–1 × 0.3–0.5 mm, as long as or slightly shorter than the sepals, shortly and densely pubescent; *stamens* 5, ca. 1 mm long; filaments free, terete, ca. 0.8 mm long; anthers ellipsoid, ca. 0.2 mm long; pistillode 3-fid, ca. 0.2 × 0.2 mm. *Pistillate flowers* 2–3 × 2–3 mm, delicate; bracts and buds as in staminate flowers; *pedicels* (0.5–)2–7 × 0.3–0.5 mm, terete, distally slightly thickened; *sepals* 5, deltoid, acute to obtuse, undulate, 1–1.5 × ca. 1 mm, erose; *petals* as in staminate flowers, but less strongly erose; *disc* as in staminate flowers, but lobes distinctly 2-fid; *ovary* globose to ovoid, 3(or 4)-locular, 3(or 4)-lobed, ca. 1 mm long; styles 3(or 4), 2-fid to the base; stylar branches terete, ca. 0.5 × 0.1–0.2 mm, ± straight, spreading to horizontal; stigmas acute. *Fruits* solitary, subglobose, 3-lobed, ca. 9 × 12–14 mm, strongly to hardly reticulate, light yellowish brown; fruiting pedicels 2–7 × 0.5–0.6 mm, terete; columella 5–6 × ca. 1 mm, basally hardly thickened, distally thickened to 1.5 mm; exocarp ca. 0.3 mm thick; endocarp 0.3–0.5 mm thick; *seeds* 1 per locule, 7–8 × 5–6 mm, smooth, shiny, ± marbled, reddish brown; embryo with thin, folded cotyledons; radicle about 3× as long as wide.

Illustrations: Radcl.-Sm. in Polhill, Fl. Trop. East Afr., Euphorb. 1: 84, figs. 11.1–5. 1987 (habit, flowers, fruits); Beentje, Kenya Trees, Shrubs & Lianas: 222. 1994 (habit).

SF 12398 (P) is the only specimen of *Wielandia fadenii* from southeast Madagascar. It is vegetatively identical to other collections of *W. fadenii*, although the leaves are thicker and dry a more yellowish green. It differs, however, in having smaller flowers with smaller, thicker, entire, spathulate, rounded to truncate petals (1 × 0.5 mm) as long as (staminate) or half as long as (pistillate) the sepals, shorter disc lobes and stamens (0.5 mm), and a larger, clavate pistillode (0.5 × 0.5 mm). It might represent a new subspecies.

Distribution and ecology. Southeast Kenya, Mayotte (Comoro Islands), and northwest Madagascar; one morphologically and geographically distinct collection from the southeast coast of Madagascar. Evergreen and seasonal forests, riverine vegetation, dry bush; on limestone in Kenya and Madagascar (whereas Mayotte is of volcanic origin); at 0–600 m altitude. Figure 12.

IUCN Red List category. The distribution area of *Wielandia fadenii* is extensive and includes three different countries. A total of 32 specimens (19 from Madagascar, two from Mayotte, and 11 from Kenya) was studied, only a few of which had developed seeds. We recommend that it be assigned, by IUCN (2001) criteria, the category Near Threatened (NT) because of deforestation throughout its range.

Etymology. The species epithet honors the senior collector of the type, Robert B. Faden.

Vernacular names. Madagascar. Fanjavala (*Labat & Deroin 2275*), Menahy (*SF 12398*), Meridina (*Humbert 18932*), Salaza (*Randrianamera? 89-RN*), Tepapanga (*Humbert 18932*), Vagmo (*SF 8256*), Velovoaraiki (*Randrianamera? 9725-RN*), Velovoaraiky (*Randrianamera? 9718-RN*).

Representative specimens examined. KENYA. Kilifi District, Chonyi Rock, 9 km NE of Kaloleni, *Bally & Smith B 14396* (K, MO); side branch of Ndzovuni river just N of ford 7 km from Mtsengo, *Luke & Robertson 6086* (K, MO); Kwale District, Chale Peninsula, *Luke 2888* (K). COMORO ISLANDS. Mayotte, Hachiroungou, *Pascal 503* (K, MO, P); Hachiroungou, *Pascal 763* (K, P). MADAGASCAR. **Antsiranana prov.:** Forêt de Sahafary, bassin de la Saharaina, *Capuron 20978-SF* (K, MO, P); Massif de l'Anjanabe, au N d'Antongondriha (bassin de l'Androranga, affluent de Bemarivo), *Capuron 773-SF* (MO, P); Massif de l'Ankarana, près d'Ambondromifehy, *Capuron 22027-SF* (K, MO, P). **Mahajanga prov.:** SW d'Antsalova, Forêt et Savoka de Tsimembo vers Tsaranandakana, Ankilimioky et Ambereny, *Capuron et al. 2312* (K, MO, P); au dessus de l'Ambodiria, 1 km a l'E d'Ambinda (RN9, près d'Antsalova), *Labat & Deroin 2275* (K, MO, P); Forêt de Tsiampihy et forêts côtières près de Besaraha de Bemiha et de Soahanina, *Leandri 2286* (P); Soalala, Andranomavo, RN 8, *Rakotovao 5690-RN* (P).

6. Wielandia laureola (Baill.) Petra Hoffm. & McPherson, comb. nov. Basionym: *Savia laureola* Baill., Adansonia 2: 33. 1861. *Petalodiscus laureola* (Baill.) Pax in Engl. & Prantl, Nat. Pflanzenfam. 3(5): 15. 1890. TYPE: Madagascar. s. loc., *L. M. A. Du Petit-Thouars s.n.* (lectotype, designated here, P!; duplicate, P!). Figures 1A–C; 4D, E; 6G, H; 7C; 8F; 9C.

Tree or shrub, 2–10 m high; indumentum absent; branches flattened or winged to angular when young, later terete. *Stipules* deltoid to ovate, acute, 0.5–1.5 × 0.5–0.7 mm, often persistent; *petioles* 2–5 × 0.8–1.5 m, adaxially channeled; petiolar vascular bundles basally U- to V-shaped in cross section, cylindrical from the middle to the distal end; *leaf blades* ovate to elliptic, apically acute to slightly acuminate, very rarely with subapical glandular thickening, basally acute to rounded, frequently (especially basally) slightly revolute, 2.5–6(–8.5) × 1–4 cm, coriaceous, adaxially green to greyish green, shiny, abaxially darker, reddish grey-green, dull to slightly shiny, midvein adaxially prominent, forming a thin undulating crest, abaxially slightly prominent, remaining venation adaxially not to hardly prominent, abaxially prominent, leaf size decreasing gradually toward the tips of the branches; anticlinal walls of leaf epidermis straight; stomata with 3(to 5) subsidiary cells. *Inflorescences* axillary; basal flowers in the axil of normal or moderately reduced foliage leaves; distal flowers in (sometimes branched) inflorescences up to 6 cm long; branches frequently subtended by reduced, subulate leaves, distally with numerous scale-like bracts; staminate and pistillate flowers in the same inflorescence. *Staminate flowers* in fascicles of up to 10(rarely up to 40) flowers; flowers up to 1 × 2.5 mm, delicate; bracts deltoid to ovate, acute, ca. 0.5 × 0.5 mm, shiny reddish brown; buds shortly pedicellate, globose to ellipsoid; *pedicels* ca. 2 × 0.2 mm, terete; *sepals* 5, 1–1.5 × 0.3–0.5 mm; the outer two oblong, rounded; the inner petaloid, spathulate, with membranous margin, apically erose; *petals* 5, spathulate to rhombic, acute to rounded, clawed, erose, ca. 1 × 0.2–0.3 mm; *disc* deeply alternipetalously lobed; lobes 5, 2-fid, ca. 0.5 × 0.2 mm; *stamens* 5, ca. 0.8 mm long; filaments basally fused to ca. 2/3 of their length, terete, ca. 0.6 mm long; anthers ovoid, ca. 0.2 mm long; pistillode 3-fid, ca. 0.2 × 0.2 mm. *Pistillate flowers* solitary, up to 2 × 2 mm, robust; bracts as in staminate flowers; buds as in staminate flowers, but shorter and with thicker pedicels; *pedicels* 1–3 × 0.5–0.8 mm, terete; *sepals* 5, 1.5–2 × ca. 1 mm thick; the outer two deltoid, acute to obtuse; the inner three oblong, rounded, with membranous margin; *petals* 5, spathulate to rhombic, acute to rounded, erose, 1.2–1.5 × ca. 0.5 mm, hardly shorter than the sepals; *disc* consisting of discrete lobes; lobes 5, petaloid, alternipetalous, truncate, erose, ca. 0.8 × 0.5 mm, delicate; *ovary* 3-locular, ovoid, ca. 1 mm long; styles 3, 2-fid to the base; stylar branches terete, ca. 0.3 × 0.1 mm, slightly spreading, recurved; stigmas truncate. *Fruits* solitary, smooth, not reticulate but somewhat wrinkled when dry, yellow to medium brown; only dehisced fruits known; fruiting pedicels 2–3 mm long; columella 6 × 0.5 mm, distally only slightly thickened; disc and perianth persistent; exocarp 0.1–1 mm thick, brittle to coriaceous, 3-layered; the middle layer fibrous (fleshy when fresh?); endocarp ca. 0.3 mm thick; *mature seeds* unknown, apparently one per locule, immature seed 5–6 × 3–6 mm.

Illustrations: Leandri in Humbert, Fl. Madagascar 111(1): 117, figs. 19.7–8. 1958 (habit).

One of the two eligible sheets (Baillon, 1861) of *Du Petit-Thouars s.n.* in P was chosen as lectotype of *Wielandia laureola* because it bears floral diagrams drawn by Baillon.

Distribution and ecology. Madagascar, restricted to area around Tamatave (east coast). The specimen *Forbes s.n.*, Mozambique, without further locality, at Kew is certainly also from Madagascar but has been erroneously labeled. Littoral forest on sand from sea level to 50 m altitude. Figure 10.

IUCN Red List category. *Wielandia laureola* is an endangered species occurring exclusively in coastal white sand forest. It is particularly vulnerable to subsistence logging by the local population because it is slow-growing. All white sand forests of Madagascar are under extreme threat. The second author is presently leading a study to determine the extent and species composition of the remaining eastern forests of this type. Conservation decisions based on the results will improve the chances of survival of species such as this one. Sixteen specimens of *W. laureola* were located in the course of this study, only one of which bears fruit (but no mature seed). The distribution area is a ca. 400-km-long stretch of coast with a maximum width of white sand forest of 5 km. Actual extent of occurrence is therefore no more than 2000 km^2. The species has been found in only seven locations (Foulpointe, Analalava, Tampina, Ambila-Lemaitso, Andovoranto, Pointe à Larree, Ataimby), the first two being but 2 km apart. None of its range is included in protected areas, and it is severely fragmented in the middle by the city of Toamasina (Tamatave), the major port of Madagascar, which is highly polluted. We therefore suggest that this species be assigned the IUCN (2001) rating Endangered: EN B1ab(iii).

Etymology. The species was probably named for the resemblance of its leaves to bay leaf, *Laurus nobilis* L., Lauraceae (Latin, laureola = a small branch of laurel, especially as to announce a victory). The epithet is a noun in apposition, not an adjective.

Vernacular names. Berando (*SF 1104*), Fanamorano (Leandri, 1958: 119; *SF 12918*), Fanazava (*SF 2943*), Maroando (*SF 2983*).

Uses. Against earache (*Martine C 16*).

Representative specimens examined. MADAGASCAR. **Toamasina prov.:** Forêt de Mangalimaso, à l'Ouest de Foulpointe, *Capuron 22083-SF* (K, MO, P); Ambila, S de Tamatave, *Decary 6536* (A, G, P, S); Tampina, près Tamatave, *Lam & Meeuse 6042* (K, MO, P); **Fianarantsoa prov.:** Antaimby, *Ranaivojaona 655* (MO, P).

7. **Wielandia leandriana** (Petra Hoffm. & McPherson) Petra Hoffm. & McPherson, comb. nov. Basionym: *Blotia leandriana* Petra Hoffm. & McPherson, Novon 7: 249. 1997. TYPE: Madagascar. Toliara prov.: Tolagnaro (Ft. Dauphin), NE of Mandena, coastal forest, roadside E & beyond QIT camp, 25 m, 7 Dec. 1989, *G. McPherson & N. Dumetz 14651* (holotype, MO!; isotypes, B!, DAV!, K!, P!, TAN!, TEF!).

IUCN Red List category. *Wielandia leandriana* is restricted to the east coast of Madagascar but has a wide latitudinal range (Hoffmann & McPherson, 1998: fig. 4A). It is known from only a limited number of collections. Considering the general threat to the eastern forests from tavy and subsistence logging, we suggest for it the IUCN (2001) rating NT (Near Threatened).

For description, list of specimens studied, and distribution map see Hoffmann and McPherson (1998).

8. **Wielandia mimosoides** (Baill.) Petra Hoffm. & McPherson, comb. nov. Basionym: *Savia mimo-*

soides Baill., Adansonia 2: 34. 1861. *Petalodiscus mimosoides* (Baill.) Pax in Engl. & Prantl, Nat. Pflanzenfam. 3(5): 15. 1890. *Blotia mimosoides* (Baill.) Petra Hoffm. & McPherson, Adansonia, sér. 3, 20(2): 253. 1998. TYPE: Madagascar. s. loc., *L. M. A. Du Petit-Thouars s.n.* (lectotype, designated by Hoffmann & McPherson, 1998: 253, P!).

Savia hildebrandtii Baill. in Grandid., Hist. Phys. Madagascar, Plantes 4 (Atlas 2): t. 209. 1892. *Blotia hildebrandtii* (Baill.) Leandri, Mém. Inst. Sci. Madagascar, Sér. B, Biol. Vég. 8: 242. 1957. TYPE: Baillon in Grandidier, 1892: t. 209. 1892.
[The specimen *Hildebrandt 3931* (P), collected in 1881, bears a strong resemblance to the type and was likely the basis for the plate.]

Savia maroando Danguy ex Lecomte, Bois d'Analamazaotra: 71. 1922. TYPE: Madagascar. Analamazaotra, *E. Thouvenot* (*coll. Ramanantsvolana*) *131* (lectotype, designated by Hoffmann & McPherson, 1998: 254, P!; duplicates, BM!, K!, P!, US!).

IUCN Red List category. *Wielandia mimosoides* is fairly widespread in the eastern half of Madagascar (Hoffmann & McPherson, 1998: fig. 4B) but not indicated from secondary habitats. The general threat to and negative projection for all primary vegetation of Madagascar necessitate that this species receives the IUCN (2001) rating of NT (Near Threatened).

For description, a complete list of specimens studied, and a distribution map see Hoffmann and McPherson (1998).

Selected specimens examined. MADAGASCAR. **Toamasina prov.:** Mangabe, Ampasimaventy, Andranomanapika, *Service Forestier 26166* (MO, P); Analamazaotra, *Thouvenot 131* (BM, K, P, US). **Toliara prov.:** Didy à Brickaville, *Cours 4716* (K, P).

9. Wielandia oblongifolia (Baill.) Petra Hoffm. & McPherson, comb. nov. Basionym: *Savia oblongifolia* Baill., Adansonia 2: 35. 1861. *Petalodiscus oblongifolius* (Baill.) Pax in Engl. & Prantl., Nat. Pflanzenfam. 3(5): 15. 1890 [as "oblongifolia"]. *Blotia oblongifolia* (Baill.) Leandri, Mém. Inst. Sci. Madagascar, Sér. B, Biol. Vég. 8: 240. 1957. TYPE: Madagascar. Ste.-Marie de Madagascar, fôret de Tafondrou, *L.-H. Boivin 1886*^{5} (lectotype, designated by Hoffmann & McPherson, 1998: 257, P!; duplicate, P!).

Savia decaryi Leandri, Bull. Soc. Bot. France 81: 589. 1934. *Savia oblongifolia* Baill. var. *decaryi* Leandri, Notul. Syst. (Paris) 7: 190. 1939. TYPE: Madagascar. Ambila, au sud du Tamatave, *R. Decary 6389* (lectotype, designated by Hoffmann & McPherson, 1998: 257, P!; duplicates, K!, US!).

IUCN Red List category. *Wielandia oblongifolia* has been collected in a large area comprising the humid eastern bioclimatic zone and the transition from humid to subhumid zones (Hoffmann & McPherson, 1998: fig. 4C). Threats to its survival come from continuing deforestation and degradation of primary habitats, and the species is here rated NT (Near Threatened) by IUCN (2001) criteria.

The first mention of this species in print was the nomen nudum *Wielandia oblongifolia* Baill. (1858: 569).

For description, a complete list of specimens studied, and a distribution map see Hoffmann and McPherson (1998).

Selected specimens examined. MADAGASCAR. **Toamasina prov.:** Ambila, S de Tamatave, *Decary 6389* (K, P, US); Analamazaotra, *Thouvenot 1918* (K, P).

10. Wielandia platyrachis (Baill.) Petra Hoffm. & McPherson, comb. nov. Basionym: *Petalodiscus platyrachis* Baill., Étude Euphorb., Atlas: 40, t. 22. 1858 [as "platyrachys"]. *Savia platyrachis* (Baill.) Baill., Adansonia 2: 33. 1861. TYPE: "Madagascar?". s. loc., *L. M. A. Du Petit-Thouars s.n.* (lectotype, designated here, P!; duplicate, P!). Figures 1L–N; 2A–C; 3I; 4F, G; 6C, D, K; 7B; 8D; 9B.

Savia pulchella Baill., Adansonia 2: 35. 1861. *Petalodiscus pulchellus* (Baill.) Pax in Engl. & Prantl, Nat. Pflanzenfam. 3(5): 15. 1890 [as "pulchella"]. Syn. nov. TYPE: "Madagascar? Arbuste du jardin de Saint-Denis de la Réunion, venu de graines rapportées de Sainte-Marie de Madagascar par Richard," *L.-H. Boivin 1886*^{3} (lectotype, designated here, P!; duplicate, P!).

Savia andringitrana Leandri, Bull. Soc. Bot. France 81: 587. 1934. Syn. nov. TYPE: Madagascar. Base nord du Pic d'Ivohibe, 24 Sep. 1926, *R. Decary 5484* (lectotype, designated here, P!; duplicates, K!, P!, US!).

Savia andringitrana Leandri var. *micrantha* Leandri, Bull. Soc. Bot. France 81: 587. 1934. Syn. nov. TYPE: Madagascar. Prov. Farafangana: Karianga, en forêt, 5 Oct. 1926, *R. Decary 5556* (holotype, P!; duplicate, BM!, K!, S!, US!).

Savia platyrachis (Baill.) Baill. var. *microphylla* Leandri, in Humbert, Fl. Madagascar 111(1): 120. 1958. Syn. nov. TYPE: Madagascar. Forêt d'Analamihilana, 850 m, 27 Dec. 1944, *G. Cours 1998* (holotype, P!).

Tree or shrub, 2–10 m high, to 1 m diameter; indumentum absent; young branches flat or winged, later terete, with lenticels. *Stipules* deltoid to ovate, acute, ± auriculate, (0.5–)1–2(–3) × 0.5–1 mm, usually persistent; *petioles* 2–5(–10) × 0.5–2 mm, adaxially channeled; petiolar vascular bundles basally in cross section U-shaped with inflexed sides, cylindrical from the middle to the distal end; *leaf blades* ovate to elliptic or oblong, apically acuminate to acute, usually distinctly dark-mucronate, basally decurrent, acute, obtuse, or rounded, often slightly auriculate, not to distinctly revolute, (1.5–)4–9(–13.5) × (0.5–)1–4(–6) cm, coriaceous to chartaceous, discolorous, adaxially greyish green, yellowish green, or olive-green, abaxially dark red to reddish brown, dull to slightly shiny on both sides; midvein adaxially prominent, forming a thin undulating crest, abaxially prominent; remaining venation slightly prominent on both sides; anticlinal walls of leaf epidermis straight; stomata with 3(or 4) subsidiary cells. *Inflorescences* terminal, axillary and cauline on the same plant, staminate and pistillate flowers in separate fascicles of 2 to 10 flowers, axillary inflorescences either 1–25 cm long, unbranched, leafless, or flowers in the axil of leaf-like bracts, transition between bracts and foliage leaves subtending flowers gradual, sometimes individual foliage leaves present in otherwise leafless inflorescences; bracts deltoid, acute, to 0.5 × 0.5 mm; buds pedicellate, globose to ellipsoid. *Staminate flowers* orange to red when fresh, maroon with yellow anthers when dry, 2–3 × 4–6 mm, robust; *pedicels* 5–12 × 0.2–0.3 mm, terete; *sepals* 5, deltoid to oblong, acute to rounded, 1–2 × ca. 1 mm; *petals* 5, orbicular to lanceolate, rounded to obtuse, clawed; the base with a distinct adaxial thickening; the margin sometimes narrowly membranous, 2–4 × 2–3 mm, about twice as long as the sepals; *disc* obscured by basal thickening of petals, ca. 0.2 mm long, annular, often with small acuminate lobes between the petals, entire to erose; *stamens* 5, 1–1.5 mm long, often no longer than the base of the petals; filaments free, leaning toward the center, terete, ca. 1 mm long (see note); anthers ovoid, close together (often giving the appearance of connate filaments), introrse, outward-pendulous, ca. 0.2 mm long; pistillode terete, 0.2–0.3 × ca. 0.2 mm, deeply 3-fid; the parts channeled inside. *Pistillate flowers* orange or red when fresh, maroon when dry, 4–5 × 5–7 mm, robust; *pedicels* 6–18 × 0.5–0.7 mm, terete, distally thickened; *sepals* 5, deltoid to oblong, acute to rounded, 1–2 × ca. 1 mm; *petals* 5, ± orbicular, rounded to obtuse, clawed; the base with a distinct adaxial thickening; the margin sometimes narrowly membranous, 3–4 × 3–4 mm, 2 to 3× as long as sepals; *disc* extending to the same length as the basal thickening of the petals, or obscured by them, ca. 0.5 mm long, annular, often with small acuminate lobes between the petals, lacerate, erose or entire; *ovary* 3-locular, ovoid, ca. 1 mm long; styles 3, 2-fid to the base or nearly so; stylar branches terete, ca. 0.5 × 0.2 mm, erect to recurved; stigmas truncate to slightly capitate. *Fruits* solitary (only one flower per fascicle reaching maturity), nearly globose, 3-lobed, ca. 8 × 10–14 mm, reticulate, smooth, medium to dark brown; fruiting pedicels (5–)7–12 × 0.4–1 mm, terete; columella ca. 7 × 1 mm, basally thickened to 1.5 mm, distally hardly thickened or up to 1.5 mm wide; disc and sepals persistent; exocarp ca. 0.2 mm thick; endocarp ca. 0.3 mm thick; *seeds* 1 or 2 per locule, apiculate, with ± distinct perichalazal annulus, globose to ovoid, 5–7 × 6–7 mm (1-seeded locules) or nearly triangular in cross section, 5–7 × 4–5 mm (2-seeded locules), rough, ± marbled, greyish brown to dark brown; embryo ovoid with hemi-ovoid cotyledons; radicle terminal, hardly longer than wide.

Illustrations: Baill., Étude Euphorb.: t. 22, figs. 11–14. 1858, reproduced in Pax in Engl. & Prantl, Nat. Pflanzenfam. 3(5): 16. 1890, Pax & K. Hoffm. in Engl., Pflanzenr. 81: 174. 1922, Nat. Pflanzenfam. ed. 2, 19c: 67. 1931 (flower). This drawing shows some characters that are atypical of *W. platyrachis*, e.g., an extremely long disc and filaments and the absence of the basal thickening of the petals, which is clearly visible in the type specimen. In addition, the drawn petals and sepals differ in outline from what we saw on the specimen. Leandri in Humbert, Fl. Madagascar 111(1): 123, figs. 20.1–5. 1958 (habit, flower, fruit). Figure 20.3 shows a petal, not a sepal (see description in Leandri, 1958: 125).

The chosen lectotype for *Wielandia platyrachis* bears the diagnosis in Baillon's handwriting, and "*Petalodiscus platyrachis* †", instead of "*Savia (Petalodiscus) platyrachis* H. Bn." as on the duplicates.

Baillon spelled the epithet three times "platyrachis" (1858: 572; 1861: 33) but only once "platyrachys" (1858: 40). The former spelling is therefore adopted here. The spelling "rachis" instead of "rhachis" is legitimate and commonly used in botany (Stearn, 1992: 478). The variant "platyrhachis" is therefore not admissible according to Art. 60.1 of the Code (Greuter et al., 2000).

The names *Savia platyrachis* and *S. pulchella* were first mentioned in print (Baillon, 1858: 572–573) as nomina nuda.

This species is very variable in leaf shape, size, and texture, which accounts for Leandri's (1934, 1958) description of a conspecific species and two varieties (see list of synonyms). The only notable morphological variation observed by us is that two of the specimens examined (*Du Petit Thouars s.n.* and *Perrier de la Bâthie 2091*, both P) have staminate flowers with considerably longer filaments (2 mm long) than in all other collections. The anthers are of normal size but are exserted from the flower and not crowded together.

Distribution and ecology. Madagascar; Sambirano, western and eastern floristic domain, to eastern border of central domain. Wet and littoral forest, on laterite and alluvial soil over basalt and sandstone; 20–1120 m altitude. Figure 12.

IUCN Red List category. *Wielandia platyrachis* is a relatively common species, occurring throughout the eastern part of the island including several protected areas (48 collections seen). In view of the high rate of destruction of primary and even secondary vegetation in Madagascar, however, using IUCN (2001) criteria, we recommend that it be rated NT (Near Threatened).

Etymology. The epithet refers to the conspicuously flattened young twigs and inflorescence axes.

Vernacular names. Andromolahy (*s. coll. 59-R273*), Hazondomohina (*s. coll. 80-R118*), Ramy (*De la Croix 7411-RN*), Tsivoka (*SF 15260*).

Representative specimens examined. MADAGASCAR. **Antsiranana prov.:** Forêt d'Andrakaraha, près d'Antalaha, *Capuron 9228-SF* (K, MO, P); National Park of Montagne D'Ambre, path from station to Bianamalao, *Du Puy et al. MB214* (K, MO). **Toamasina prov.:** Ile de Nosy Mangabe, au fond de la baie d'Antongil, *Capuron 22897-SF* (K, MO, P); Colline de Menatany, au Sud de Soanierana-Ivongo, *Capuron 23828-SF* (K, MO, P); près d'Ankarahara (P.K. 100 de la route Tananarive–Moramanga), rive gauche du Mangoro, *Capuron 22908-SF* (K, MO, P). **Fianarantsoa prov.:** au P. K. 253 de la route Ivohibe–Farafangana près du Village de Beravy, *Capuron 23555-SF* (K, MO, P); Réserve Spéciale de Manombo, Parcelle 1, *Hoffmann et al. 284* (DAV, G, K, MO, P, TAN). **Toliara prov.:** Forêt de Bemangidy, au N de Mahatalaky (Ft. Dauphin), *Capuron 11793-SF* (K, MO, P); Ste. Luce, proposed QIT Madagascar Minerals ilmenite mining conservation area, *Hoffmann et al. 202* (K, MO, TAN); Environs de Ft. Dauphin, flanc E du pic St. Louis, *Humbert 5894* (A, P, US).

11. Wielandia ranavalonae (Leandri) Petra Hoffm. & McPherson, comb. nov. Basionym: *Savia ranavalonae* Leandri, Mém. Inst. Sci. Madagascar, Sér. B, Biol. Vég. 8: 239. 1957. TYPE: Madagascar. Tsinjoarivo, sur l'Onive, à l'Est d'Ambatolampy, 10 Apr. 1949, *R. Capuron (Service des Eaux et Forêts) 602* (lectotype, designated here, P!; duplicates, K!, MO!). Figures 3A–C; 4A, B; 6F, J; 7F; 8E; 9F; 14.

Shrub or small tree, 2–6 m high, up to 10 cm DBH; bark smooth, pinkish grey; branches glabrous, minutely scabrous only when very young, young slightly flattened, later terete. *Stipules* deltoid, acute, ca. 1 × 0.5 mm, glabrous, caducous; *petioles* 2–6 × 1–1.5 mm, adaxially channeled, glabrous; petiolar vascular bundles in cross section cylindrical; *leaf blades* obovate, more rarely elliptic to oblong, apically retuse to rounded, tip of midvein glandular, usually dark, basally acute to rounded, not or (especially basally) slightly revolute, with exmedial ultimate marginal venation, 2.5–6 × 1–3.5 cm, glabrous, coriaceous, green to greyish green on both sides, dull; midvein adaxially prominent; remaining venation adaxially prominent or not prominent; all veins abaxially prominent; anticlinal walls of leaf epidermis straight; stomata with (2 or)3(or 4) subsidiary cells. *Flowers* green with white petals and a yellowish disc when fresh. *Staminate flowers* cauline or axillary, solitary or in fascicles of up to 3 flowers, 2–3 × 4–5 mm, delicate; bracts deltoid, acute, ca. 0.7 × 0.3–0.5 mm, minutely scabrous; *pedicels* 2–5 × ca. 0.5 mm, terete or flattened, glabrous; *sepals* 5, erect, ca. 1.5–2 × 1.5–2 mm, nearly orbicular, rounded, glabrous, erose; the outermost smaller than the innermost; the innermost slightly clawed; *petals* 5, 2–3 × 1–1.5 mm, oblong, ± rounded, erose, glabrous; *disc* fleshy, annular but deeply lobed; lobes 5, 0.5–0.7 × ca. 1 mm, alternipetalous, distally truncate, erose or 2-lobed, erect, glabrous; *stamens* 5, 1–2 mm long; filaments ca. 1 × 0.2 mm, ± terete, fused for about half of their length; anthers 0.3–0.5 × 0.3–0.5 mm; connectives not thickened; thecae parallel; pistillode 0.2–0.5 × 0.2–0.5 mm, 2- or 3-lobed, glabrous. *Pistillate flowers* axillary, solitary, 4–5 × ca. 6 mm, robust; bracts deltoid, acute, ca. 1 × 1 mm, minutely scabrous; *pedicels* 10–20 × 0.5–1.5 mm, terete to flattened, distally slightly thickened, glabrous; *sepals* 5, erect, 1.5–2.5 × ca. 1.5 mm, ± membranous, fimbriate, otherwise glabrous; the outermost deltoid, acute to obtuse; the innermost oblong, rounded; *petals* 5, spathulate, orbicular, or rhombic, acute to rounded, clawed, ± erose, 3–4 × 1–2 mm, glabrous, about twice as long as sepals; *disc* annular, 5-lobed; lobes alternipetalous, ca. 1 mm long, distally ± 2-lobed, glabrous; *ovary* 3-locular, cylindrical to globose, ca. 1 mm long, glabrous; styles 3, 2-fid to the base; stylar branches short and thick, horizontally spreading to recurved, 0.5–0.8 mm long, basally ca. 0.5 mm thick, glabrous; stigmas acute. *Fruits* solitary, subglobose, 3-lobed, 8–15 × 10–16 mm, glabrous, reticulate to rugose, smooth, light yellowish brown to medium brown; fruiting pedicels (3–)10–20 × 1–1.5 mm, terete or flattened, glabrous; columella 8–12 × ca. 1 mm, basally thickened to 1.5 mm, distally clavate to 2–3 mm for 3–4 mm of its length; disc and perianth persistent; exocarp 0.2–0.3 mm thick; endocarp 0.3–0.5 mm thick; *seeds* 1 or 2 per locule; in 1-seeded locules ellipsoid, 7–10 × 7–10 × 5–6 mm, smooth, blackish brown, with large hilum (ca. 4 × 1 mm) in the center of the ventral face; micropyle lateral, directly above hilum, protruding ca. 1 mm; embryo ellipsoid with hemi-ellipsoid cotyledons; radicle subterminal, hardly longer than wide.

No collection number is given in the protologue of the basionym *Savia ranavalonae* (Leandri, 1957); however, the lectotype is the only specimen cited by

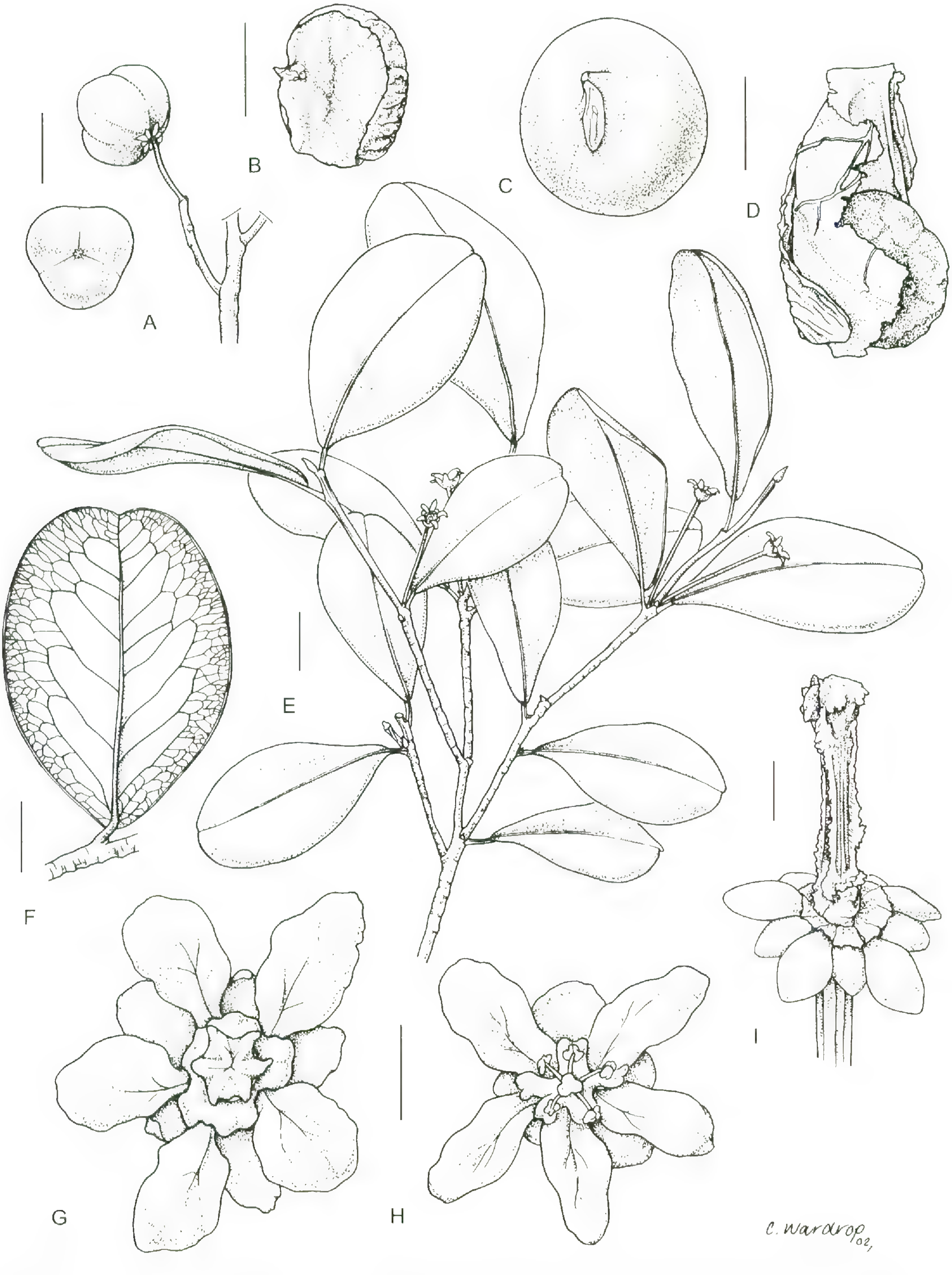

Figure 14. *Wielandia ranavalonae.* —A. Fruit, seen from above and lateral view. —B. Dry cotyledon with radicle. —C. Seed, ventral view. —D. Fruit fragment with dry seed. —E. Flowering branch. —F. Leaf. —G. Pistillate flower. —H. Staminate flower. —I. Columella with persistent perianth and disc. A, E, G–I, *Capuron 20586-SF* (K); B–D, *Perrier de la Bâthie 16954* (K); F, *Capuron 602-SF* (P). Scale bars = 10 mm in A, E, F; 5 mm in B–D; 2 mm in G–I. Drawn by Catherine Wardrop.

Leandri later in the *Flore* (1958: 122). No other specimen collected by Capuron before 1960 was deposited in Paris under this name.

Distribution and ecology. Western and central Madagascar and Comoro Islands (Mayotte). Dry and montane forest in Madagascar between 100 and 2000 m; in Mayotte in lowland rainforest between 90 and 120 m altitude. Figure 11.

IUCN Red List category. *Wielandia ranavalonae* has been collected only nine times in Madagascar and twice in Mayotte. However, its distributional range is very large, and it seems to have little preference as to altitude and vegetation type. The species is locally common in the single locality (an area of basaltic rock of less than 1 km^2) where it occurs in Mayotte (F. Barthelat, pers. comm.). It occurs in the protected areas of Andohahela and Zombitsy and, encouragingly, several recent collections bear fruit. We therefore suggest that, despite the few known collections, it be assigned to IUCN (2001) category NT (Near Threatened).

Etymology. This species is named after one of three Malagasy queens, Ramavo Ranavalona I (1790–1861), Ramona Ranavalona II (1829–1883), or Razafindrahety Ranavalona III (1861–1917).

Vernacular names. Mayotte: Tsatsikysembitry kely (Shibuchi; *Labat et al. 3290*).

Representative specimens examined. COMORO ISLANDS. Mayotte, Chiconi, Sohoa, réserve forestière de Sohoa, *Labat et al. 3290* (K, MO, P). MADAGASCAR. **Antsiranana prov.:** Daraina, forêt d'Antsahabe, *Nusbaumer 981* (G, K); **Toliara prov.:** Andohahela RN, *Eboroke et al. 946* (MO, P); Forêt d'Analavelona (bassin du Fiherenana), *Humbert 19760* (K, P); Zombitsy, Réserve Naturelle 7, PK 783, à 1 km au N du village d'Andranomaitso en dehors de la réserve, le long du layon qui limite la réserve, *Randrianaivo et al. 180* (MO).

12. Wielandia tanalorum (Leandri) Petra Hoffm. & McPherson, comb. nov.

Basionym: *Blotia tanalorum* Leandri, Mém. Inst. Sci. Madagascar, Sér. B, Biol. Vég. 8: 243. 1957. TYPE: Madagascar. Farafangana prov.: Ivohibe, bord de chemin, *R. Decary 5104* (lectotype, designated by Hoffmann & McPherson, 1998: 259, P!; duplicate, K!).

IUCN Red List category. *Wielandia tanalorum* has been less frequently collected than other former *Blotia* species, but its occurrence over a large area in eastern Madagascar, running all the way from the north to the south of the island (Hoffmann & McPherson, 1998: fig. 4D), means that it is assigned the IUCN (2001) rating of NT (Near Threatened).

For description, a complete list of specimens studied, and a distribution map see Hoffmann and McPherson (1998).

Selected specimens examined. MADAGASCAR. **Antsiranana prov.:** Vallée intérieure de l'Androranga, affl. de la Bemarivo (nord-est) aux environs d'Antongodriha, Mont Anjenabe, *Humbert & Capuron 24041* (K, MO, P). **Toamasina prov.:** Farafangana, Ivohibe, *Decary 5104* (K, MO, P).

13. Wielandia unifex Petra Hoffm. & McPherson, sp. nov.

TYPE: Madagascar. Antsiranana prov.: Sahafary, 15°17.41′S, 50°22.46′E, 39 m, 13 Oct. 2000, *R. Randrianaivo & R. Bernard 556* (holotype, K!; isotypes, MO!, TAN!, US!). Figure 11.

Haec species inter species generis *Wielandiae* combinatione apiculum foliorum longi-acuminatorum cum petiolis teretibus, longis (4–6 mm), gracilibus (0.5–0.8 mm diametro), petalis sepalis brevioribus, disco glabro distinguenda.

Treelet 3 m; indumentum absent; young twigs terete. *Stipules* mainly broken off, some basal portions remaining; to 1.2 mm long, ca. 0.7 mm wide, hard; *petioles* 4–6 × 0.5–0.8 mm, terete; *leaf blades* elliptic-oblong, sometimes slightly ovate or obovate, apically long-acuminate (acumen 10–20 mm, ultimately ± rounded), basally acute to obtuse, not decurrent, 4.5–6.5 × 1.5–2.3 cm, thickly chartaceous, drying olive-green and dull on both sides; venation slightly prominent on both sides, 5 to 7 secondary veins per leaf half, long, simple, unbranched intersecondary veins present in most intercostal fields, areoles very small and regular. *Flowers* not seen. *Infructescences* axillary, with fruits solitary or rarely in twos; fruiting pedicels (7–)10–15 mm long, terete, inarticulate; bracts deltoid, acute, 0.5–1 × 0.5 mm, entire, scarious; perianth and disc persistent in fruit; *sepals* 5, oblong, apically rounded, ca. 1.5 × 1–1.2 mm, entire; *petals* 5, broadly spathulate, apically rounded, ca. 1 × 0.6–0.7 mm, slightly erose, clawed at base to about a third of their length, shorter than sepals, apex reflexed in fruit; *disc* annular, glabrous, ca. 0.5 mm long, deeply alternipetalously 5-lobed; lobes apically truncate, ca. 0.3 × 0.7–0.8 mm. *Fruit* a 3-locular schizocarp, estimated ca. 9 mm in diameter (only dehisced mericarps seen), dehiscing septicidally, loculicidally, and septifragally; dehiscence of septae irregular; styles 3, bifid; stigmas acute; exocarp strongly reticulate, green drying olive-green, 0.1–0.2 mm thick, endocarp ca. 0.4 mm thick; columella 6–7 × 0.8–1 mm, basally hardly thickened, distally thickened to 1.5 mm, ca. 6× longer than the narrowest width; *seeds* immature, 1 or 2 per locule, reddish brown.

IUCN Red List category. *Wielandia unifex* is rated DD (Data Deficient), by IUCN (2001) criteria, because it is only known from the type. The collection notes indicate that it is locally common.

Etymology. The epithet is Latin and means "the One-Maker." It refers to the crucial role that the discovery of this taxon played in our decision to unite all Western Indian Ocean taxa of tribe Wielandieae in one genus, *Wielandia*.

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APPENDIX 1. List of species.

1. *Wielandia bemarensis* (Leandri) Petra Hoffm. & McPherson
2. *Wielandia bojeriana* (Baill.) Petra Hoffm. & McPherson
3. *Wielandia danguyana* (Leandri) Petra Hoffm. & McPherson
4. *Wielandia elegans* Baill.
5. *Wielandia fadenii* (Radcl.-Sm.) Petra Hoffm. & McPherson
6. *Wielandia laureola* (Baill.) Petra Hoffm. & McPherson
7. *Wielandia leandriana* (Petra Hoffm. & McPherson) Petra Hoffm. & McPherson
8. *Wielandia mimosoides* (Baill.) Petra Hoffm. & McPherson
9. *Wielandia oblongifolia* (Baill.) Petra Hoffm. & McPherson
10. *Wielandia platyrachis* (Baill.) Petra Hoffm. & McPherson
11. *Wielandia ranavalonae* (Leandri) Petra Hoffm. & McPherson
12. *Wielandia tanalorum* (Leandri) Petra Hoffm. & McPherson
13. *Wielandia unifex* Petra Hoffm. & McPherson